Supreme Court, U.S.
FILED

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No. _____

In The

Supreme Court of the United States

PHELPS DODGE CORPORATION and
ARIZONA PUBLIC SERVICE COMPANY,

Petitioners,

v.

THE UNITED STATES, et al.,

Respondents.

**On Petition For Writ Of Certiorari
To The Supreme Court
Of The State Of Arizona**

PETITION FOR WRIT OF CERTIORARI

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QUESTION PRESENTED

Does a sudden, unpredictable and retroactive change in judicial precedent that revokes vested property rights in groundwater constitute a taking of private property without just compensation in violation of the Fifth Amendment to the United States Constitution?

PARTIES TO THE PROCEEDINGS

Petitioners are Phelps Dodge Corporation, a Delaware corporation, and Arizona Public Service Company, an Arizona corporation. Each of the petitioners has filed one or more Statements of Claimant in the underlying proceeding before the Superior Court of the State of Arizona, In and For the County of Maricopa, for adjudication of rights to waters in the Gila River System and Source in Arizona. Each of the petitioners also engages in operations or activities within the State of Arizona that depend upon the use of groundwater.

Respondents are all other parties to the appeal below before the Supreme Court of the State of Arizona, case numbers WC-90-0001-IR through WC-90-0007-IR (consolidated) and WC-79-0001 through WC-79-0004 (consolidated) from which this petition arises.* The Respondents are:

United States of America
Gila River Indian Community
Hopi Tribe
San Carlos Apache Tribe
Tonto Apache Tribe
Yavapai Apache Indian Tribe, Camp Verde Reservation

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* The following entities listed as parties to the appeal below before the Supreme Court of the State of Arizona are not considered Respondents because they or their successors are, in their current corporate status, related to Petitioner Phelps Dodge Corporation: Cyprus Christmas Mining Corporation; Cyprus Miami Mining Corporation; Cyprus Pima Mining Corporation; Cyprus Sierrita Corporation; and Cyprus Twin Buttes Corporation.

PARTIES TO THE PROCEEDINGS – Continued

State of Arizona
Maricopa County, Arizona
Pima County, Arizona
City of Benson, Arizona
City of Chandler, Arizona
City of Glendale, Arizona
City of Globe, Arizona
City of Goodyear, Arizona
City of Mesa, Arizona
City of Phoenix, Arizona
City of Scottsdale, Arizona
City of Sierra Vista, Arizona
City of Tempe, Arizona
City of Tucson, Arizona
Town of Gilbert, Arizona
Town of Mammoth, Arizona
Town of Patagonia, Arizona
Town of Wickenburg, Arizona
Apache Nitrogen Products, Inc.
Arlington Canal Company
Arizona Rock Products Association
ASARCO, Inc.
Bella Vista Ranches Limited Partnership
Bella Vista Water Company, Inc.
Buckeye Irrigation Company
Buckeye Water Conservation and Drainage District
Central Arizona Irrigation and Drainage District
Church of Jesus Christ of Latter-Day Saints
Cortaro-Marana Irrigation District
Cortaro Water Users' Association
Farmers' Investment Company
Franklin Irrigation District

PARTIES TO THE PROCEEDINGS – Continued

Members of the Gila Bend-Dendora Valley Water Users Association
Gila Valley Irrigation District
Heber Domestic Water Improvement District
Silas Kisto
Wayne D. Klump
Little Colorado Water Association
Magma Copper Company (now BHP Copper)
Maricopa County Water Conservation District No. 1
Maricopa-Stanfield Irrigation and Drainage District
Nature Conservancy
New Magma Irrigation and Drainage District
Paloma Investment L.P. (now Gillespie Dam Investments, LLC)
Paloma Ranch Investments
Peabody Coal Company
Pinetop Water Company
Ponderosa Domestic Water Improvement District
Represented Claimants, who are 50 named persons and entities
Rigby Water Company
Rio Rico Properties, Inc.
Roosevelt Irrigation District
Roosevelt Water Conservation District
Salt River Project Agricultural Improvement & Power District
Salt River Valley Water Users' Association
San Carlos Irrigation and Drainage District
Sky-Hi Domestic Water Improvement District
St. David Irrigation District
Tenneco Arizona Properties Corporation
Tenneco West, Inc.

PARTIES TO THE PROCEEDINGS – Continued

Valencia Water Company, Inc.
Vernon Domestic Water Improvement District
Ray Wrobley, Charles Onion, John Kovavich,
Dennis Weckerly – officers and directors
of Verde Valley Water Users, Inc.

Each of the foregoing is a claimant in the adjudication below in the Maricopa County Superior Court concerning water rights in the Gila River System and Source, or in a second general stream adjudication pending in Apache County Superior Court, Cause No. 6417, concerning water rights in the Little Colorado River System and Source. Each of these parties appeared pursuant to the Orders Concerning Petitions for Interlocutory Review (filed December 11, 1990) of the Supreme Court of the State of Arizona as a party to the appeal from which this petition for writ of certiorari arises. Thousands of additional parties have filed Statements of Claimant in the underlying adjudication before the Maricopa County Superior Court, but did not appear as parties in the appeal from which this petition arises. Therefore, these additional claimants are not considered Respondents to this petition pursuant to the Rules of the Supreme Court of the United States.

CORPORATE DISCLOSURE

Pursuant to Rule 29(6), Rules of the Supreme Court of the United States, the Petitioners disclose that Petitioner Phelps Dodge Corporation has no parent corporation and that no publicly held corporations own 10 percent or more of the stock of Petitioner Phelps Dodge Corporation. The parent corporation for Petitioner Arizona Public Service Company is Pinnacle West Capital Corporation, and no other publicly held corporations own 10 percent or more of the stock of Petitioner Arizona Public Service Company.

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PETITION FOR WRIT OF CERTIORARI

Petitioners, Phelps Dodge Corporation and Arizona Public Service Company, respectfully petition for a writ of certiorari to review the September 22, 2000 opinion of the Supreme Court of the State of Arizona. This opinion (the "Opinion Below") retroactively changed long-standing judicial precedents concerning the nature of rights in underground water in the State of Arizona. Petitioners assert that this retroactive change was such a sudden and unpredictable departure from the Supreme Court of Arizona's prior precedents that it has effected a judicial taking of private property without compensation in violation of the takings clause of the Fifth Amendment to the United States Constitution.

OPINIONS BELOW

The Opinion Below is reported at 9 P.3d 1069 (Ariz. 2000) and is reprinted in Appendix A. The order of the Maricopa County Superior Court from which the above appeal ensued, dated June 30, 1994 (the "1994 Order"), is unpublished and is reprinted in Appendix B. The Arizona Supreme Court's opinion remanding the original issue to the trial court, *In re the General Adjudication of All Rights to Use Water In the Gila River System and Source*, ("*Gila II*"), is reported at 857 P.2d 1236 (Ariz. 1993) and is reprinted in Appendix C.

The Arizona Supreme Court's Orders Concerning Petitions for Interlocutory Review, dated December 11, 1990, are unpublished and are reprinted in Appendix D. The Special Procedural Order Providing for Interlocutory Appeals and Certifications adopted by the Arizona

Supreme Court on September 26, 1989 is unpublished and is reprinted in Appendix E. Additional relevant orders of the trial court are unpublished and are reprinted in Appendices F through I.

JURISDICTION

The Arizona Supreme Court issued the Opinion Below on September 22, 2000. Motions for Reconsideration were filed by Petitioners and by ASARCO Incorporated on October 10, 2000. The court denied both motions on December 19, 2000. This petition for writ of certiorari is filed within 90 days of the denial of the motions for reconsideration, pursuant to Rules 13(3) and 29(2), Rules of the Supreme Court of the United States.

The jurisdiction of this Court is invoked under 28 U.S.C. § 1257(a).

STATUTORY PROVISIONS INVOLVED

1. The takings clause of the Fifth Amendment to the United States Constitution provides in relevant part:

> [N]or shall private property be taken for public use without just compensation.

2. Arizona Revised Statutes (A.R.S.) § 45-141.A. provides:

> The waters of all sources, flowing in streams, canyons, ravines or other natural channels, or in definite underground channels, whether perennial or intermittent, flood, waste or surplus water, and of lakes, ponds and springs on the surface, belong to the public and are subject to

appropriation and beneficial use as provided in this chapter.

STATEMENT OF THE CASE

A. Procedural History of the Question Presented.

This case is a general adjudication of all rights to use water in the Gila River System and Source in the State of Arizona. It was initiated in 1974 by the filing of a petition to adjudicate conflicting claims to water rights in a portion of the Gila River Basin. *See United States v. Superior Court*, 697 P.2d 658, 663 (Ariz. 1985). Additional petitions were subsequently filed for other portions of the Basin, and these several actions were consolidated by the Arizona Supreme Court into a single, comprehensive general stream adjudication. *Id.* at 664. As a general adjudication, this case affects the water rights of all claimants who assert a right to use any water subject to the jurisdiction of the court within the geographic boundaries of the Gila River Basin. Furthermore, because "[w]ater usage in Arizona exceeds available surface supply," *id.* at 663, the claims of any one party to the adjudication will " 'inescapably vie with other public and private claims for the limited quantities to be found in the rivers and streams' " of Arizona. *Id.* (quoting *United States v. New Mexico*, 438 U.S. 696, 699 (1978)).

The Gila River Basin encompasses approximately 47% of the land in Arizona. The waters of the Basin are used by millions of Arizonans for municipal, agricultural, industrial, recreational and other purposes. Approximately 85% of the state's population resides in the Basin. *See* J. Folk-Williams, *The Gila Basin and the Waters of Southern Arizona*, at 4 (1991). However, the surface waters

in the Gila River System supply only one-fourth of the Basin's water requirements. *Id.* The balance is met either with Colorado River water imported through the Central Arizona Project, or by groundwater pumped from the large regional aquifers that underlie most of the land in the Basin. *Id.*

As will be discussed in greater detail below, Arizona law establishes a bifurcated system of water rights under which surface water and the "subflow" of surface streams are subject to the doctrine of prior appropriation, while "percolating" groundwater is not subject to appropriation. Instead, percolating groundwater is subject either to the doctrine of reasonable use, under which all landowners have an equal right to use groundwater underlying their lands for any reasonable purpose on the land from which it is withdrawn, *Bristor v. Cheatham*, 255 P.2d 173, 177 (Ariz. 1953), or to the statutory requirements of the Arizona Groundwater Code, A.R.S. § 45-401 *et seq.*

Because every claimant is, to one extent or another, adverse to all other claimants, the Gila River Adjudication is a lawsuit of nearly unrivaled scope, complexity and duration. In the late 1970s and early 1980s, more than 849,000 summonses were sent to potential claimants notifying them of the pendency of the case and the procedure for submitting their water rights claims to the court. *See In the Matter of the Rights to the Use of the Gila River* ("*Gila I*"), 830 P.2d 442, 446 (Ariz. 1992). Those persons to whom summonses were sent included virtually all landowners within the geographic boundaries of the Gila River Basin, as well as "all well owners of record and all known holders of water rights within the watersheds. . . . " *Id.* In response, more than 66,000 separate "Statements of Claimant" were filed by more than 24,000 claimants.

Many of these claims asserted only a right to use groundwater in accordance with state law.[1]

B. Superior Court Proceedings Below.

Given the large number of claimants, this case is one of the most complex legal proceedings ever adjudicated in the United States. Because of this complexity, a number of threshold jurisdictional issues required resolution before adjudication of individual claims could begin. *See Arizona v. San Carlos Apache Tribe*, 463 U.S. 545 (1983); *United States v. Superior Court*, 697 P.2d 658 (Ariz. 1985).

After resolution of these threshold issues, the trial court began prioritizing the thousands of claims in the Gila River Adjudication. The court issued comprehensive case management orders and convened frequent status conferences intended to identify and address important legal issues requiring early attention by the court.

During this process of framing the issues that would determine the future course of the adjudication, the trial court held hearings on the relationship between groundwater and surface water for the general education of all parties and the court. Following the hearings, several

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[1] A second general stream adjudication is pending in the Little Colorado River Basin in northeastern Arizona. Although the issue addressed in this petition arose in the Gila River Adjudication, the Opinion Below also may be applied in the Little Colorado River Adjudication. *See* Opinion Below, 9 P.3d at 1081 at App. A27. The Little Colorado River Basin comprises approximately 21,000 square miles in Arizona, and more than 3,100 claimants have filed more than 11,000 claims in the adjudication. As in the Gila River Adjudication, many of these claims assert only a right to use groundwater pursuant to state law.

parties filed a motion for summary judgment to "exclude from the adjudication all wells which are pumping 'percolating groundwater' " and to include only those wells pumping surface flow and subflow within the meaning of *Maricopa County Municipal Water Conservation District No. One v. Southwest Cotton Co.*, 4 P.2d 369 (1931) ("*Southwest Cotton*"). In considering the issues raised in the motion, the court determined, *sua sponte*, that it would be "appropriate to expand the citie's [sic] motion to the entire issue of the Ground Water and Surface Water Relationship. . . . " Minute Entry, November 20, 1987, at App. H3.

Subsequently, in January 1988, the trial court ordered the parties to brief eight issues it intended to resolve concerning the interrelationship between groundwater and surface water. Among these issues, the court identified the question: "Is ground water included within the phrase 'river system and source' as it is used in A.R.S. §§ 45-141 and 45-251(B), and if so, to what extent is it included?" Minute Entry, January 19, 1988, at App. G2.

After these questions were briefed and argued, the court issued an order, dated September 9, 1988 (the "1988 Order"), ruling on each of the eight issues identified in its prior minute entry. On the question of whether groundwater is included within the phrase "river system and source," the court ruled that groundwater is included in the river system and source only if it is a stream's "subflow." 1988 Order, at App. F13. The court further concluded that certain wells pumping water from the "younger alluvium" of a stream basin should be presumed to be pumping appropriable subflow and should be included in the Arizona Department of Water Resources' "hydrographic survey reports" if the wells met the following test:

> As to wells located in or close to that younger alluvium, the volume of stream depletion would reach 50% or more of the total volume pumped during one growing season for agricultural wells or during a typical cycle of pumpage for industrial, municipal, mining, or other uses, assuming in all instances and for all types of use that the period of withdrawal is equivalent to 90 days of continuous pumping for purposes of technical calculation.

Id., at App. F14. The effect of this ruling was to declare that groundwater users pumping water within this definition of subflow were diverting appropriable surface water under A.R.S. § 45-141.A. "Therefore, [groundwater users'] rights to that water would depend on the priority of their appropriation, rather than on an owner's right to remove water percolating under the surface of the owner's land." *Gila II*, 857 P.2d at 1239, at App. C7.

Although this 50%/90 day test was explicitly acknowledged by the trial court to be "somewhat arbitrary," the court explained it as being instructive to the Department of Water Resources in preparing hydrographic survey reports. 1988 Order, at App. F14.

C. Proceedings Before the Arizona Supreme Court.

On September 26, 1989, the Arizona Supreme Court adopted its Special Procedural Order Providing for Interlocutory Appeals and Certifications ("Special Procedural Order"). *See* App. E. The court made this order specifically applicable to appeals of "any ruling of the superior court" in the Gila River Adjudication. Special Procedural Order, at App. E1. The text of the Special Procedural Order explains the court's purpose in issuing the order:

> The purpose of this order is to establish a procedure for early review of all substantial questions in this general adjudication of water rights. Early appellate review may avoid wasteful trial court proceedings, may result in substantial savings of time or expense, or may for other reasons be in the interests of justice.

Id., at App. E8.

After issuance of the Special Procedural Order, numerous parties petitioned the Arizona Supreme Court for review of various aspects of the trial court's 1988 Order. On December 11, 1990, the court granted review of six specific issues that it "reformulated" from among the many petitions filed regarding the trial court's order. *See* Orders Concerning Petitions for Interlocutory Review, December 11, 1990, at App. D. One of these six issues was the subject of the Opinion Below. Identified by the court as Issue Number 2, it was stated as:

> 2. Did the trial court err in adopting its 50%/90 day test for determining whether underground water is "appropriable" under A.R.S. § 45-141?

Id., at App. D2.

The Arizona Supreme Court answered this question in the affirmative. In doing so, the court expressly concluded that the 50%/90 day test was inconsistent with the requirement of Southwest Cotton that subflow is found only " 'within, or immediately adjacent, to' the stream bed." *Gila II*, 857 P.2d at 1245, at App. C21 (quoting *Southwest Cotton*, 4 P.2d at 381). The court specifically stated: "Whether a well is pumping subflow does not turn on whether it depletes a stream by some particular amount in a given period of time." *Id.*, 857 P.2d at 1246, at App. C24. Consequently, the court vacated the 50%/90 day test, rejected the trial

court's "younger alluvium" test as too broad, reaffirmed *Southwest Cotton*'s narrow concept of subflow, and remanded the matter to the trial court to determine appropriate criteria for separating appropriable subflow from percolating groundwater. *See Gila II*, 857 P.2d at 1246-48, at App. C26-30.

D. Proceedings After Remand.

After the Arizona Supreme Court's opinion in *Gila II*, the trial court conducted further proceedings, including evidentiary hearings and a tour of the San Pedro River Basin (a portion of the larger Gila River Basin), to determine the criteria for defining subflow. Following the evidentiary hearings, the court issued its second ruling on the subject. *See* 1994 Order, at App. B. Specifically, the court adopted the "saturated floodplain Holocene alluvium" as the geologic unit that defines subflow. *Id.*, at App. B57. The court also ruled that "any well located outside the 'subflow' zone that now pumps any percentage of water either from the stream itself or its 'subflow' zone, should be included in the adjudication and the total amount of water withdrawn subjected to this [adjudication]." *Id.*, at App. B62.

Once again, numerous parties appealed the trial court's decision. Groundwater users, in particular, challenged the court's decision as being inconsistent with the narrow definition of subflow set forth in *Southwest Cotton*. The groundwater users also argued that the court's order was an unconstitutional judicial taking of private property because it radically and suddenly departed from established state law and effectively rewrote the definition of appropriable water under A.R.S. § 45-141.A.

The Arizona Supreme Court disagreed with the groundwater users' position and affirmed the 1994 Order.

See Opinion Below, 9 P.3d at 1083, at App. A33. The court also asserted that "landowners have no 'legally recognized property right in potential, future groundwater use.' " *Id.* (quoting *Gila I*, 830 P.2d at 451).

REASONS FOR GRANTING THE PETITION

This petition should be granted, and a writ of certiorari issued, because the Arizona Supreme Court, in rendering the Opinion Below, "has decided an important question of federal law that has not been, but should be, settled by this Court," and it has done so in a way that "conflicts with relevant decisions of this Court." Rule 10(c), Rules of the Supreme Court of the United States. Specifically, the Opinion Below, while retroactively changing Arizona water law in a way that invalidates vested property rights, summarily dismissed the arguments of groundwater users that such a sudden and unpredictable change in the law constitutes a taking of private property in violation of the Fifth Amendment. The court rejected these arguments without any analysis of this Court's precedents concerning the takings clause of the Fifth Amendment, and it did so in a way that clearly conflicts with those precedents.

Because of the enormous importance of this issue to millions of Arizona residents who depend on groundwater, as well as the citizens of other states who might be subject to sudden changes in judicial precedents announced by their state courts, this Court should grant this petition and issue a writ of certiorari to review the Opinion Below.

I. THE OPINION BELOW, BY UNPREDICTABLY EXPANDING THE DEFINITION OF SUBFLOW, TAKES PROPERTY FROM LANDOWNERS WHO RELIED ON THE FORMERLY NARROW DEFINITION WHEN DECIDING WHERE TO LOCATE AND INVEST IN WELLS.

A. Until the Opinion Below, "subflow" was always a narrow concept.

Under Arizona law, water is considered either appropriable or non-appropriable. *See* Opinion Below, 9 P.3d at 1073, App. A6. The primary category of water subject to appropriation is surface water "flowing in streams, canyons, ravines or other natural channels," together with a limited category of underground water flowing "in definite underground channels. . . . " A.R.S. § 45-141.A. In addition, the courts of Arizona have long held that the "narrow" category of underground "subflow" is considered "a part of the surface stream" and therefore subject to appropriation. *Southwest Cotton*, 4 P.2d at 380. *See also Gila II*, 857 P.2d at 1241, at App. C13.

Arizona courts have repeatedly held that subflow is a narrow concept, stating that it consists of "those waters which slowly find their way through the sand and gravel *constituting the bed of the stream, or the lands under or immediately adjacent to the stream*," *Southwest Cotton*, 4 P.2d at 380 (emphasis added); that "[i]n almost all cases the so-called subflow is found *within, or immediately adjacent to*, the bed of the surface stream itself," *id.* at 381 (emphasis added); and that " '*the water must be within the bed of the surface stream itself*. Otherwise such underground waters must be classified with percolating waters. . . . ' " *Gila II*, 857 P.2d at 1244, at App. C19 (quoting 2 Clesson S.

Kinney, The Law of Irrigation and Water Rights, § 1161, at 2110 (2d ed. 1912)) (emphasis added).

All other underground water, whether or not it is hydrologically connected to a surface stream, is considered "percolating" groundwater that is not subject to appropriation. As stated by the court in *Gila II*:

> The *Southwest Cotton* court examined Arizona statutes from 1864 and its previous decisions and reaffirmed its prior holding that percolating subterranean water was not subject to appropriation. [citation omitted] Language in the opinion makes it clear that the court meant that *all percolating water, however classified, was not subject to appropriation.*

Gila II, 857 P.2d at 1241, at App. C11 (emphasis added).

Instead, percolating groundwater is subject to the doctrine of reasonable use, *see Bristor*, 255 P.2d at 177, or to the statutory provisions of the Arizona Groundwater Code, A.R.S. § 45-401, *et seq.* Furthermore, Arizona courts have consistently applied a presumption "that underground waters are percolating in their nature" and required that one "who asserts that they are not must prove his assertion affirmatively by clear and convincing evidence." *Southwest Cotton*, 4 P.2d at 376.

This distinction is crucial. Under Arizona law, a person may not obtain an appropriative right to percolating groundwater. Yet the effect of the Opinion Below is to transform vast quantities of what had formerly been percolating goundwater into subflow that is suddenly subject to appropriation. Because the Gila River system is already significantly over-appropriated, all persons who have relied on this water will be left with no right to pump it, and the investments they have made in reliance on that water will be destroyed.

B. The Opinion Below approved a test of subflow that constitutes a sudden and unpredictable departure from all prior judicial precedents.

In the Opinion Below, the Arizona Supreme Court upheld a trial court ruling (the 1994 Order), that turns the narrow concept of subflow on it head. Specifically, the trial court adopted as its subflow zone the entire "saturated floodplain holocene alluvium." 1994 Order, at App. B54. The court did so in spite of its acknowledgement that this phrase is but another name for the "younger alluvium" already rejected as a subflow zone by the Arizona Supreme Court in *Gila II*. *Id.*

As the *Gila II* court stated:

> We believe the trial court's [original subflow test] expands the clear words of A.R.S. § 45-141(A) to include not only waters flowing in streams but, *potentially, waters pumped any place in the younger alluvium*. The court's order does not explain the rule's derivation. The [trial court's test] *does not comport* with the tests laid down in *Southwest Cotton*.

Gila II, 857 P.2d at 1247, at App. C26 (emphasis added).

In spite of this clear rejection of a subflow zone as broad as the entire younger alluvium, the trial court nevertheless adopted exactly that geologic unit as its subflow zone in the 1994 Order. By doing so, the trial court radically departed from the Arizona Supreme Court's consistently stated position that the subflow zone is "narrow." In fact, the record compiled by the trial court demonstrates just how broad this new subflow zone is. Specifically, the record indicates that the trial court's subflow zone is as broad as one to two miles wide in various locations in the San Pedro River Basin, and in at

least one location in this basin is estimated to be as much as five miles wide. Testimony of Thomas Gookin, transcript dated Feb. 2, 1994, at 35-37; Testimony of Oliver Page, transcript dated February 1, 1994, at 174. This very broad subflow zone, in a basin where the principal river channel is often only a few hundred feet wide,[2] simply cannot be squared with the narrow subflow zone adopted by *Southwest Cotton* and reaffirmed by *Gila II*.

The impact of this over-broad subflow zone is dramatic. Of the 3,364 registered wells in the San Pedro River Basin, approximately 1,262, or 38% of the total, are within the trial court's subflow zone. Testimony of Jon Ford, transcript dated Jan. 31, 1994, at 64-65. Many of these wells have been drilled in the years since *Southwest Cotton* was decided, and their owners were entitled to rely on that court's narrow concept of subflow. These well owners had no way of knowing that their wells would some day be subject to injunction by the holders of surface water rights. Moreover, even had these well owners attempted to obtain the protection of an appropriative water right for the water pumped from their wells, the Arizona Department of Water Resources (the state agency charged with administering appropriative water rights) would have rejected their applications for such rights. Record at D.N. 1113, Aff. of Richard Gessner.

The trial court's radical departure from prior precedents was further compounded by the "cones of depression" portion of its 1994 Order. In this section of the order (*see* App. B58-63), the trial court concluded that even a well located a significant distance from the already over-

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[2] *See, e.g.*, Record at Docket Number ("D.N.") 2299, Errol L. Montgomery and Associates, Inc., "Criteria for Determining Subflow" December 14, 1993, at 16.

broad subflow zone would be presumed to be pumping appropriable subflow if its cone of depression extends into the subflow zone and the well "pumps *any percentage* of water either from the stream itself or its 'subflow' zone." 1994 Order, at App. B62 (emphasis added). In such cases, "the total amount of water [whether subflow or not, would be] subjected to" the general stream adjudication. *Id.*

The record compiled by the trial court demonstrates just how broadly this sweeping declaration will apply. Specifically, the record identifies wells as far as six miles from the trial court's subflow zone from which the cones of depression extend into the zone. Record at D.N. 2297, Leonard Rice Consulting Water Engineers, Inc., "Methodology and Procedure for Identifying Subflow and Wells that Pump Subflow," December, 1993, at 55-63. Thus, under the trial court's cone of depression analysis, a well located *six miles* from the subflow zone, and even farther from the river itself, will be "subjected to" the adjudication and exposed to injunctions in favor of surface water appropriators. This is so in spite of the fact that the court in *Southwest Cotton* determined that water from some of the plaintiff's wells, also located up to six miles from the nearest surface stream, was non-appropriable percolating groundwater. *See Gila II*, 857 P.2d at 1240, fn. 4, at App. C10. The trial court's broad cone of depression analysis cannot be reconciled with the narrow concept of subflow previously adhered to by the courts in Arizona.

The 1994 Order, now approved by the Arizona Supreme Court, will subject the owners of numerous wells, and all persons and activities dependent on water pumped from such wells, to injunctions in favor of persons holding surface water rights. The trial court adopted

this position in spite of its acknowledgement that the San Pedro River "naturally and normally produces approximately 160,000 acre-feet of surface water per year"[3] and, in contrast, "the storage capacity of the San Pedro Aquifer . . . was 84 million acre-feet." 1994 Order, at App. B13. Thus, the Opinion Below will destroy the investments of thousands of people who depend on wells that draw from the 84 million acre-feet of groundwater in this basin, in favor of a limited number of surface water appropriators who draw on the 160,000 acre-feet of surface water in the basin. Similar results will occur in river basins throughout Arizona.

This is no small matter to groundwater users in Arizona. Even in a basin such as the San Pedro, with only a limited population base,[4] many millions of dollars have been invested in agricultural, industrial, commercial and municipal developments that are dependent on water withdrawn from wells. These wells are now subject to the court's over-broad subflow zone and even broader cone of depression ruling. Additional billions of dollars of investments have been made elsewhere in the state, and the lives and livelihoods of millions of Arizonans are dependent on water withdrawn from wells that were

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[3] An acre-foot is the amount of water required to cover a one acre surface one foot deep. It is equivalent to 325,851 gallons and is commonly considered to be a sufficient quantity to meet the needs of a typical family of four for a period of one year.

[4] Cochise County, Arizona, through which most of the length of the San Pedro River flows, has a population of 123,750, according to the County's official web site, http://www.co.cochise.az.us.

located in reliance on the narrow subflow zone of *Southwest Cotton*. All of these investments have been directly undercut by the 1994 Order and the Opinion Below.

C. The Opinion Below's approval of a broad subflow zone constitutes a sudden and unpredictable change in state law that destroys vested property rights.

In its 1994 Order, the trial court expressed its dissatisfaction with the *Gila II* opinion, noting that "[u]nfortunately, the term 'subflow,' which 'In re Gila' [*Gila II*] deals with, has no scientific meaning in the vocabulary of hydrologists or geologists." 1994 Order, at App. B26. Apparently, this dissatisfaction led the trial court to adopt a subflow zone that coincides with the already rejected "younger alluvium." However, as the *Gila II* court had already noted, "even though *Southwest Cotton* may be based on an understanding of hydrology less precise than current theories, it would be inappropriate to undo that which has been done in the past." *Gila II*, 857 P.2d at 1243, at App. C16-17. The *Gila II* court also acknowledged that the line drawn by *Southwest Cotton* between appropriable subflow and non-appropriable percolating groundwater is "artificial." *Id.* at 1246, at App. C25. Nevertheless, the court did "not feel free to redraw or erase that line." *Id.*

The reasons for this refusal to undo more than sixty years of precedent were very clearly stated by the *Gila II* court:

> We believe it is too late to change or overrule the case. More than six decades have passed since *Southwest Cotton* was decided. The Arizona legislature has erected statutory frameworks for regulating surface water and groundwater

> based on *Southwest Cotton*. Arizona's agricultural, industrial, mining, and urban interests have accommodated themselves to those frameworks. *Southwest Cotton* has been part of the constant backdrop for vast investments, the founding and growth of towns and cities, and the lives of our people.

Id., 857 P.2d at 1243, at App. C16. The court went on to note that it must approach any potential change in the law "with particular care when the prospective effect of change threatens important vested rights and may affect every Arizonan's well-being." *Id.*

Even in 1931, the *Southwest Cotton* court recognized the significance of its holding, stating that "[this] case is one of the most important which has ever come before this court, involving as it does . . . property interests of the value of many millions of dollars. . . . " and concluding that "these principles should be enunciated as clearly and definitely as possible, so that our citizens may know how to guide their future procedure." *Southwest Cotton*, 4 P.2d at 372.

Now, some seventy years later, millions of Arizonans have, in fact, relied on *Southwest Cotton's* clearly enunciated principles when making decisions about where to locate wells, and whether and where to invest many billions of dollars in agricultural, industrial, commercial and municipal developments dependent on those wells. The 1994 Order and the Opinion Below have directly undercut these investments by suddenly and unpredictably changing long-settled legal principles. Under the precedents of this Court, such a change in the law constitutes a taking of private property in violation of the Fifth Amendment to the Constitution of the United States.

II. THE OPINION BELOW, BY UNILATERALLY DECLARING THAT "LANDOWNERS HAVE NO LEGALLY RECOGNIZED PROPERTY RIGHT IN POTENTIAL, FUTURE GROUNDWATER USE," TAKES FROM LANDOWNERS BOTH JUDICIALLY DECLARED AND STATUTORILY ESTABLISHED PROPERTY RIGHTS TO USE GROUNDWATER.

In dismissing Petitioners' argument that the trial court's new subflow zone and its cone of depression analysis violate the takings clause of the Fifth Amendment, the Arizona Supreme Court quoted, out of context, a statement from its earlier opinion in *Gila I* that "landowners have 'no legally recognized property right in potential future groundwater use.' " Opinion Below, 9 P.3d at 1083, at App. A33 (quoting *Gila I*, 830 P.2d at 451).

In *Gila I*, this statement was made only in the context of the conclusion that groundwater users had been provided adequate notice, for due process purposes, that the "issue of when underground water is appropriable might be litigated in the adjudication." *Gila I*, 830 P.2d at 451. The court held that the notice provided to potential claimants of groundwater specifically instructed such claimants to inform the court of their claims. *Id.* Thus, the notice was sufficient regardless of the nature of any rights such claimants might have in groundwater, and the court's statement regarding potential future uses of groundwater was *dictum*. More importantly, in making the statement, the *Gila I* court misapplied a much more limited proposition from the earlier case of *Town of Chino*

Valley v. City of Prescott, 638 P.2d 1324 (Ariz. 1981), *appeal dismissed*, 457 U.S. 1101 (1982) ("*Chino Valley II*").[5]

A. Under Arizona law, the Doctrine of Reasonable Use is a rule of property that may only be prospectively modified by the Legislature.

In *Chino Valley II*, the court held that rights to use groundwater may be "modified *prospectively by the Legislature.*" *Id.*, at 1327 (emphasis added). This proposition is true. It is also a statement of limited scope. As the Arizona Supreme Court went on to note, "courts will adhere to an announced rule to protect rights acquired under it and that if any change in the law is necessary, it should be made by the Legislature." *Id.* Thus, *Chino Valley II* is not inconsistent with, and did not purport to overrule, a long line of cases that have concluded a landowner's right to withdraw and use groundwater is a property right entitled to protection.

For example, the Arizona Supreme Court has held that:

> At the outset it must be conceded that the interests which petitioners seek to protect are property rights. We recognized in *Farmers Investment Company v. Bettwy* [citation omitted] that the doctrine of reasonable use as judicially determined in Arizona *had become a rule of property* and was entitled to protection as such.

Town of Chino Valley v. State Land Dep't, 580 P.2d 704, 709 (Ariz. 1978) ("*Chino Valley I*") (emphasis added).

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[5] As the court itself acknowledged in *Chino Valley II*, "[d]ictum thrice repeated is still dictum." *Id.*, 638 P.2d at 1327.

Similarly, in deciding to uphold the doctrine of reasonable use for percolating groundwater, and reconfirming that such groundwater is not subject to appropriation, the Arizona Supreme Court held that:

> Whether we should . . . , after approximately fifty years' operation under [the doctrine of reasonable use], depart therefrom depends upon many questions, the most important of which is the protection of property rights acquired upon the faith of this court's announcement of the law.
>
> . . . .
>
> It is generally so well known that we take judicial notice that, with faith in the foregoing declaration and assurance of this court, many and large investments have been made in the development of ground waters. Under these circumstances the court's announcement of the rule becomes a rule of property . . . ; and when a decision does become a rule of property, the rights acquired thereunder are entitled to protection under the law as declared.

Bristor, 255 P.2d at 175 (citation omitted).[6]

Chino Valley II is not to the contrary. It merely acknowledges the fact that the Legislature may *prospectively* regulate groundwater uses in a legitimate exercise of its police power to protect public health and safety. It does not stand for the much broader proposition that a landowner has "no legally recognized property right in

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[6] *See also Jarvis v. State Land Dep't*, 479 P.2d 169, 172-73 (Ariz. 1970), *modified on other grounds*, 550 P.2d 227 (Ariz. 1976) (right to pump and transport groundwater "is a rule of law controlled by the doctrine of reasonable use and protected by the constitution of the state as a right of property").

potential, future groundwater use." In making this statement in the Opinion Below, the Arizona Supreme Court has repudiated nearly 100 years of judicial precedent and, without warning, obliterated a property right upon which millions of Arizonans are dependent, and in reliance on which billions of dollars of investments have been based.

B. The Arizona Legislature has created numerous statutory rights to future use of groundwater.

In 1980, the Arizona Legislature enacted the Groundwater Management Act. The Act statutorily confirmed the doctrine of reasonable use, *see* A.R.S. § 45-453, and also enacted the Groundwater Code, which comprehensively regulates groundwater rights and uses in "Active Management Areas" ("AMAs") within the state. These AMAs encompass the major population centers of Arizona, including the Phoenix and Tucson metropolitan areas, as well as the Prescott area and the major agricultural regions of Pinal County. Collectively, these AMAs are home to more than 3.5 million people,[7] and they are the location for thousands of acres of irrigation-dependent agriculture and many large industrial facilities, including mines and power plants operated by Petitioners. All of these residents, much of the agriculture, and numerous industrial operations are dependent, at least in part, upon groundwater withdrawn under the provisions of the Groundwater Code.

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[7] This figure is taken from the AMAs' Third Management Plans and other reports on the Arizona Department of Water Resources website, http://www.water.az.gov.

Among those provisions are numerous examples of statutorily established rights to pump and use groundwater within AMAs. For example, Irrigation Grandfathered Rights have been established for persons who were engaged in irrigation of lands within AMAs during specified periods of time prior to establishment of the AMA in question. *See* A.R.S. § 45-465. Persons who have retired their lands from active irrigation and who meet specified criteria are entitled to pump groundwater for non-irrigation purposes pursuant to Type 1 Non-Irrigation Grandfathered Rights. *See* A.R.S. § 45-463. Similarly, Type 2 Non-Irrigation Grandfathered Rights are based on historical uses of groundwater for non-agricultural purposes. *See* A.R.S. § 45-464. Although these rights were established based on historical water use, they all provide landowners with a right to continue pumping groundwater into the future.

In addition, several types of groundwater rights within AMAs are based on projected, rather than historical, use of groundwater. For example, under specified circumstances, groundwater use permits "shall" be issued to persons who are "engaged in or propose[ ] to engage in" mineral extraction and processing. A.R.S. §§ 45-513 and 45-514. The Groundwater Code also mandates issuance of groundwater permits for general industrial uses when statutory requirements are satisfied. *See* A.R.S. § 45-515. Most significantly, a municipality or private water company within an AMA has a statutory right to "withdraw and transport groundwater within its service area for the benefit of landowners and residents within its service area, and the landowners and residents are entitled to use the groundwater delivered," subject only to restrictions on transportation of groundwater across

groundwater basin boundaries and conservation requirements promulgated by the Arizona Department of Water Resources. A.R.S. § 45-492.A. These "service area rights" may expand to meet the demands of expanding populations, regardless of the quantity of past withdrawals. *Id.*

As these statutory provisions demonstrate, there are numerous instances where landowners have very clear, and very valuable, rights to "potential, future groundwater use." Moreover, these rights are just as clearly "property" for purposes of the takings clause of the Fifth Amendment.[8] In Arizona, as in much of the arid west, the right to use water is an essential element of the right to make productive use of one's land. While the right to use water can be regulated prospectively by the Legislature, *see Chino Valley II*, 638 P.2d at 1327,[9] a court may not retroactively destroy that right through the mere expedient of declaring that it never existed in the first place.

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[8] For example, Type 2 non-irrigation grandfathered rights established pursuant to A.R.S. § 45-464 have an established market value, and are regularly purchased, sold and leased by water users in AMAs.

[9] The statutory rights created by the Groundwater Code are subject to regulation by the Arizona Department of Water Resources pursuant to the provisions of the Code and management plans promulgated by the Department pursuant to A.R.S. Title 45, Chapter 2, Article 9.

III. THE FIFTH AMENDMENT PROHIBITS SUDDEN AND UNPREDICTABLE CHANGES IN JUDICIAL PRECEDENT AND REDEFINITIONS OF PRIVATE PROPERTY THAT TAKE VESTED RIGHTS WITHOUT COMPENSATION.

The takings clause of the Fifth Amendment has been the subject of extensive analysis by this Court over the course of many years. From scores of cases, the Court has distilled several basic principles of "takings" law. First, the takings analysis requires "essentially *ad hoc*, factual inquiries" to determine whether the government action in question has "interfered with distinct investment-backed expectations. . . . " *Penn Central Transp. Co. v. New York City*, 438 U.S. 104, 124 (1978). Second, the Court has analyzed whether the government action "interfere[d] with interests that were sufficiently bound up with the reasonable expectations of the claimant to constitute 'property' for Fifth Amendment purposes." *Id.* at 125. The Court has also held that government actions denying "all economically beneficial or productive use of land" categorically violate the Fifth Amendment. *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1015 (1992).

In addition, although rights in private property generally are determined by reference to state law, "if the protection against physical appropriations of private property [is] to be meaningfully enforced, *the government's power to redefine the range of interests included in the ownership of property* [is] *necessarily constrained by constitutional limits.*" *Id.* at 1014 (emphasis added) (citing *Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393 (1922)). Put another way, "a State, by *ipse dixit*, may not transform private property into public property without

compensation. . . . " *Webb's Fabulous Pharmacies, Inc. v. Beckwith*, 449 U.S. 155, 164 (1980).

Under these principles, the Opinion Below must be subjected to an *ad hoc* factual inquiry to determine whether it has interfered with reasonable, distinct, investment-backed expectations regarding property interests in percolating groundwater. The Opinion Below also must be scrutinized to determine whether it will deny all economically beneficial use of the land of those persons who invested in wells in reliance on the prior pronouncements of the Arizona Supreme Court and the Arizona Legislature. Furthermore, the Opinion Below cannot stand simply by redefining the property interest in percolating groundwater in a way that better suits the court's current views. On each of these points, the Opinion Below fails to satisfy this Court's standards for determining whether government action is consistent with the requirements of the Fifth Amendment.

As was discussed above, billions of dollars have been invested over many years in reliance on the narrow subflow zone of *Southwest Cotton* and the non-appropriable nature of percolating groundwater in Arizona. The Arizona Supreme Court has repeatedly recognized this fact. *See Southwest Cotton*, 4 P.2d at 372; *Bristor*, 255 P.2d at 175; *Jarvis*, 479 P.2d at 172-73; *Chino Valley I*, 580 P.2d at 709; *Gila II*, 857 P.2d at 1243, at App. C16. With this long line of cases providing repeated reassurance that the rules regarding percolating groundwater were rules of property and would be respected, the expectations of all who made investments dependent on such groundwater were plainly reasonable.

The Opinion Below, by unpredictably expanding the subflow zone and broadening its reach even farther

through the cone of depression analysis, and by declaring that landowners have no property right in potential future groundwater use, has destroyed the reasonable investment-backed expectations of millions of Arizonans. Using the broad scope of the Opinion Below, a limited number of surface water appropriators now will be able to enjoin groundwater pumping from thousands of wells throughout the Gila and Little Colorado River Basins. Those who depend on that groundwater will be left without recourse. They could not have obtained an appropriative water right at the time the wells were drilled,[10] and it would do no good to obtain one now because the Gila and Little Colorado Rivers are significantly over-appropriated. *See, e.g., United States v. Superior Court*, 697 P.2d at 663. All landowners who find themselves in this position will be denied *any* economically beneficial or productive use of their land because *all* uses of land in Arizona are directly dependent on access to water.

In the Opinion Below, the Arizona Supreme Court turned its back on a century of Arizona water law and vitiated both statutory and judicially-recognized water rights upon which millions of Arizona residents depend. Although the court may have acted out of a sense of frustration with the perceived inaction of the Arizona Legislature,[11] even "a strong public desire to improve the

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[10] *See* Record at D.N. 1113, Aff. of Richard Gessner.

[11] At oral argument, a Justice of the Arizona Supreme Court made the following statement in response to a point made by counsel for the groundwater users:

> The problem – I wish the problem was as easy as you put it. The statute talks about stream water and other statutes talk about groundwater. But the problem is, somewhere you have to draw the line in order to

public condition is not enough to warrant achieving the desire by a shorter cut than the constitutional way of paying for the change." *Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 416 (1922). Here, the Arizona Supreme Court has not even acknowledged that its opinion retroactively changes essential rules of property, much less offered any payment for the change. For this reason, the Opinion Below violates the takings clause of the Fifth Amendment.

While the Arizona Supreme Court asserted that its decision is consistent with its prior precedents, 9 P.3d at 1080, at App. A25-26, it is simply not possible to reconcile the Opinion Below with a fair reading of *Southwest Cotton* and *Gila II*. As this Court held in *Webb's Fabulous Pharmacies*, "[n]either the Florida Legislature by statute, *nor the Florida courts by judicial decree*, may accomplish the result the county seeks simply by recharacterizing" property. 449 U.S. at 164 (emphasis added). Likewise, the Arizona Supreme Court may not dispense with the property rights of groundwater users merely by declaring that those rights did not exist in the first place.

> determine which is which. And the Legislature has not seen fit to tell us where the line is. So the courts, for 70 years or 80 years, have tried to struggle to find out – to draw – sort of an artificial line. And *Gila II* invited the Legislature to do what legislators ought to do in this, and to make that line – that that's where the line should be drawn. But they have not done anything about it. And so here we are again, asking, probably in the worst place of all to solve the problem, and somebody's got to draw the line. And so the question is really where the line is.

Videotape of Oral Argument, December 7, 1999.

While this Court has not directly addressed whether a radical departure by a state court from its prior precedents may constitute a taking, Justice Stewart recognized this point more than 30 years ago in *Hughes v. Washington*, 389 U.S. 290 (1967) (Stewart, J., concurring). In *Hughes*, Justice Stewart concluded that the Supreme Court of Washington could not "be permitted to defeat the constitutional prohibition against taking property without due process of law by the simple device of asserting retroactively that the property it has taken never existed at all." *Id.* 389 U.S. at 296-97 (Stewart, J. concurring).

Although not a holding of this Court, Justice Stewart's statement is entirely consistent with *Webb's Fabulous Pharmacies* and numerous other pronouncements of the Court. Under all of these cases, neither a legislature nor a court may retroactively revoke vested property rights.[12] Because the Opinion Below does so, it violates the takings clause of the Fifth Amendment to the Constitution of the United States.

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[12] The Arizona Supreme Court itself has recognized this principle in the context of legislative changes affecting vested water rights. *San Carlos Apache Tribe v. Superior Court*, 972 P.2d 179, 189 (Ariz. 1999) (noting that "legislation may not disturb vested substantive rights by retroactively changing the law that applies to completed events. . . . We agree . . . that the water rights of the parties in the Gila and Little Colorado general stream adjudications are vested substantive property rights.") (citations omitted).

CONCLUSION

For the foregoing reasons, the Court should grant this petition for writ of certiorari.

Dated, Phoenix, Arizona, March 19, 2001.

Respectfully submitted,

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PETITION FOR WRIT OF CERTIORARI
ISSUE TWO
APPENDIX

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APPENDIX A

Supreme Court of Arizona.

In re the GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN the GILA RIVER SYSTEM AND SOURCE

Nos. WC-90-0001-IR, WC-90-0002-IR, WC-90-0003-IR, WC-90-0004-IR, WC-90-0005-IR, WC-90-0006-IR, WC-90-0007-IR, WC-79-0001, WC-79-0002, WC-79-0003, WC-79-0004.

9 P.3d 1069

Sept. 22, 2000.

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Jennings, Strouss & Salmon, P.L.C. By: M. Byron Lewis, John B. Weldon, Jr. Stephen E. Crofton, Phoenix, Attorneys for Salt River Project Agricultural Improvement and Power District, and Salt River Valley Water Users' Association.

United States Department of Justice By: Lois J. Schiffer, Robert L. Klarquist, David C. Shilton, Gary B. Randall, F. Patrick Barry, Washington, D.C., Attorneys for United States.

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Chandler, Tullar, Udall & Redhair By: Stephen B. Weatherspoon, Tucson, Attorneys for The Nature Conservancy.

Sparks & Siler, P.C. By: Joe P. Sparks, John H. Ryley, Kevin T. Tehan, Scottsdale, Attorneys for San Carlos Apache Tribe, Tonto Apache Tribe, and Yavapai Apache Tribe.

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John S. Schaper, Phoenix, Attorney for Buckeye Irrigation Company and Buckeye Water Conservation and Drainage District.

Ulrich & Anger, P.C. By: William H. Anger, Paul G. Ulrich, Phoenix, Attorneys for the Cities of Chandler, Glendale, Mesa, and Scottsdale.

PELANDER, Judge.

¶ 1 This appeal again presents the second of six issues on which we granted interlocutory review in the

Gila River general stream adjudication. The facts and procedural history of this case are set forth in detail in *In re the General Adjudication of All Rights to Use Water in the Gila River System and Source,* 175 Ariz. 382, 384-86, 857 P.2d 1236, 1238-40 (1993) (*"Gila River II"*), and in *In re Rights to the Use of the Gila River,* 171 Ariz. 230, 232-33, 830 P.2d 442, 444-45 (1992) (*"Gila River I"*). In short, the primary issue we consider here is whether, after remand in *Gila River II,* the trial court properly determined what underground water constitutes "subflow" of a surface stream, thus making it appropriable under A.R.S. § 45-141(A).[1]

¶ 2 Based on its consideration of extensive evidence presented on remand, including the opinions of multiple experts, the trial court defined "subflow" as the " 'saturated floodplain Holocene alluvium' "[2] because "[t]he

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[1] Section 45-141(A), A.R.S., states:

> The waters of all sources, flowing in streams, canyons, ravines or other natural channels, or in definite underground channels, whether perennial or intermittent, flood, waste or surplus water, and of lakes, ponds and springs on the surface, belong to the public and are subject to appropriation and beneficial use as provided in this chapter.

[2] "Holocene" refers to the Holocene epoch, which is that part of the Quaternary period that covers approximately the most recent 10,000 years. During that time frame, floods caused rivers to carry and deposit certain materials that originated from erosion of bedrock and basin fill deposits. The "Holocene alluvium," also referred to as the younger or floodplain alluvium, is the sedimentary material in a river valley that resulted from that process. *See* American Geological Institute, *Glossary of Geology* 17, 301 (Julia A. Jackson, ed., 1997).

weight of the evidence" pointed to that geological unit "as the most credible 'subflow' zone." We conclude, and the parties conceded at oral argument, that the record reasonably supports that central finding as well as the trial court's related findings. We further conclude that the trial court's ruling is not invalidated by this court's prior decisions relating to subflow. *See Gila River II; Maricopa County Mun. Water Conservation Dist. No. One v. Southwest Cotton Co.*, 39 Ariz. 65, 4 P.2d 369 (1931). Finally, the ruling comports with hydrological reality as it is currently understood. *See In re the General Adjudication of All Rights to Use Water in the Gila River System and Source*, 195 Ariz. 411, ¶ 9, 989 P.2d 739, ¶ 9 (1999) ("*Gila River III*"). For these reasons, we affirm the trial court's order in its entirety.

I. GENERAL PRINCIPLES OF SUBFLOW

¶ 3 In *Gila River II*, we explained the importance of distinguishing between groundwater and surface water. 175 Ariz. at 386, 857 P.2d at 1240. Essentially, our bifurcated system of allocating water rights differentiates groundwater users from surface water users. By statute, surface water is subject to the doctrines of prior appropriation and beneficial use. *See* A.R.S. §§ 45-141(A), 45-251(7). Percolating groundwater, on the other hand, is not appropriable and may be pumped by the overlying landowner, subject to the doctrine of reasonable use, *Gila River II*, 175 Ariz. at 386, 857 P.2d at 1240; *Bristor v. Cheatham*, 75 Ariz. 227, 255 P.2d 173 (1953), and the federal reserved water rights doctrine discussed in *Gila River III*.

¶ 4 The boundary between surface water and groundwater is not at all clear. Most surface streams not only flow above the ground but also have "subflow." As the parties correctly point out, "subflow" is not a scientific, hydrological term. But for almost seventy years, this court has defined "subflow," for legal purposes, as "those waters which slowly find their way through the sand and gravel constituting the bed of the stream, or the lands under or immediately adjacent to the stream, and are themselves a part of the surface stream." *Southwest Cotton*, 39 Ariz. at 96, 4 P.2d at 380. *See also Gila River II*, 175 Ariz. at 390 n. 9, 857 P.2d at 1244 n. 9, *quoting Black's Law Dictionary* 1425 (6th ed.1990); 2 Clesson S. Kinney, *A Treatise on the Law of Irrigation and Water Rights* § 1161, at 2106-07 (2d ed.1912) ("subflow" is "the broad and deep subterranean volume of water which slowly flows through the sand and gravel underlying most, if not all, of the streams which traverse the country adjacent to the mountain systems of the arid region").

¶ 5 As we noted in *Gila River III*, "[t]he notion of 'subflow' is significant in Arizona law, for it serves to mark a zone where water pumped from a well so appreciably diminishes the surface flow of a stream that it should be governed by the same law that governs the stream." 195 Ariz. 411, ¶ 8, 989 P.2d 739, ¶ 8. In addition, "subflow" is "probably much greater in volume in some cases than the water upon the surface, and [is] . . . a valuable portion of the well-defined surface stream." Kinney, *supra* at 2107. Because subflow is considered part of the surface stream, it is appropriable as such under § 45-141(A). *See Gila River II*, 175 Ariz. at 387, 857 P.2d at 1241. *See also Gila River III*, 195 Ariz. 411, ¶ 8, 989 P.2d

739, ¶ 8. Under Arizona's bifurcated system of managing surface and groundwater, the concept of subflow serves to protect appropriable surface water rights against interference caused by the pumping of groundwater. Because water is a very precious and limited commodity in Arizona, much turns on how "subflow" is determined.

¶ 6 Underground waters are presumed to be percolating and, therefore, not appropriable as subflow. *Southwest Cotton*, 39 Ariz. at 85, 4 P.2d at 376. One who asserts that underground water is a part of a stream's subflow must prove that fact by clear and convincing evidence. *Id.* "If [the Department of Water Resources (DWR)] uses the proper test and relies on appropriate criteria for determining whether a well meets the test, its determination that a well is pumping appropriable subflow constitutes clear and convincing evidence." *Gila River II*, 175 Ariz. at 392, 857 P.2d at 1246. Thus, it is critical that any test used for determining the boundaries of a subflow zone be as accurate and reliable as possible. Otherwise, use of an inaccurate test to determine whether a well is pumping subflow would not satisfy the clear and convincing evidentiary standard and would improperly shift the burden to the groundwater user to show that its well is not pumping subflow. *See id.* at 388-89, 857 P.2d at 1242-43.

II. GILA RIVER II

¶ 7 In *Gila River II*, we considered whether the trial court had erred "in adopting its 50%/90 day test for determining whether underground water is 'appropriable' under A.R.S. § 45-141." 175 Ariz. at 386, 857 P.2d at 1240. Under that test, a well would be presumed to be

pumping appropriable subflow if "the volume of stream depletion would reach 50% or more of the total volume pumped during . . . [a] period of withdrawal [that] is equivalent to 90 days of continuous pumping for purposes of technical calculation." *Id.* at 385, 857 P.2d at 1239. Holding that "the 50%/90 day test for identifying wells presumed to be pumping subflow is inconsistent with *Southwest Cotton* and should not be used," *id.* at 392, 857 P.2d at 1246, we vacated that portion of the trial court's order and remanded the case for the court "to take evidence and, by applying the principles contained in [the *Gila River II*] opinion, determine the criteria for separating appropriable subflow from percolating groundwater." *Id.* at 394, 857 P.2d at 1248.

¶ 8 In so holding, we reaffirmed the principles set forth in *Southwest Cotton*, noting that our role was to interpret, not to expand or in any way change, the holdings in that case. *Id.* at 389, 857 P.2d at 1243. The *Southwest Cotton* court observed that, "[i]n almost all cases the so-called subflow is found within, or immediately adjacent to, the bed of the surface stream itself." 39 Ariz. at 97, 4 P.2d at 381. The court articulated the following test for determining whether a well is pumping subflow:

> *Does drawing off the subsurface water tend to diminish appreciably and directly the flow of the surface stream?* If it does, it is subflow, and subject to the same rules of appropriation as the surface stream itself; if it does not, then, although it may originally come from the waters of such stream, it is not, strictly speaking, a part thereof, but is subject to the rules applying to percolating waters.

Id. at 97, 4 P.2d at 380-81.

¶ 9 In *Gila River II*, we adhered to that test and reaffirmed what we described as "*Southwest Cotton's* narrow concept of subflow." 175 Ariz. at 393, 857 P.2d at 1247. We rejected the trial court's 50%/90 day test in part because of the potential that, under that test, all wells in an alluvial valley could be said to be pumping appropriable subflow. *Id.* at 391, 393, 857 P.2d at 1245, 1247. The 50%/90 day test was "broad enough to include all underground water hydraulically connected to a surface stream." *Id.* at 391, 857 P.2d at 1245. Thus, the test was "at odds with *Southwest Cotton's* statement that subflow is found within or immediately adjacent to the stream bed." *Id.*

¶ 10 We discussed that problem at some length in *Gila River II*. *See* 175 Ariz. at 390-92, 857 P.2d at 1244-46. Specifically, the 50%/90 day test did not distinguish between wells pumping groundwater from tributary aquifers and those pumping actual subflow of the river. Tributary aquifers are

> those waters which infiltrate their way through the adjoining ground to some surface water course or other body of surface water. These waters differ from the [sub]flow of surface streams in the fact that *they have not yet reached the channels of the water courses to which they are tributary;* while, upon the other hand, the [sub]flow of surface streams ha[s] reached these channels and are therefore dealt with as component parts of such streams.

Kinney, *supra* § 1193, at 2162 (footnotes omitted) (emphasis added). *See also Gila River II*, 175 Ariz. at 389 n.

7, 857 P.2d at 1243 n. 7 ("A tributary aquifer is an aquifer having a direct hydraulic connection with a stream or with another aquifer that has such a connection."). Water in underground tributary aquifers is not a part of the surface stream and may not be considered subflow. *See Gila River II*, 175 Ariz. at 391, 857 P.2d at 1245 (noting that, under *Southwest Cotton*, subflow and tributary groundwater are "two different classes of underground water. The former is subject to appropriation . . . ; the latter is not."). But, "[g]iven enough time, and with certain exceptions, all extractions from a tributary aquifer will cause a more- or-less corresponding depletion from stream flow volume." *Id.* Thus, under the 50%/90 day test, the water in underground tributary aquifers would have been included as subflow if the volume and time requirements were met, even though that water is specifically excluded under *Southwest Cotton*.

¶ 11 The arbitrariness of the 50%/90 day test also influenced our decision in *Gila River II*. *Id.* at 392, 857 P.2d at 1246. We stated that "[w]hether a well is pumping subflow does not turn on whether it depletes a stream by some particular amount in a given period of time. . . . [I]t turns on whether the well is pumping water that is more closely associated with the stream than with the surrounding alluvium." *Id.* We also suggested that a proper test might compare "such characteristics as elevation, gradient, and perhaps chemical makeup" of the surface stream and underground water. *Id.* In addition, "[f]low direction can be an indicator. If the water flows in the same general direction as the stream, it is more likely related to the stream." *Id.*

¶ 12 In sum, we rejected the trial court's 50%/90 day rule because it conflicted with *Southwest Cotton* and arbitrarily set time and volume limits rather than determining the nature of the water being pumped. *Id.* at 391- 92, 857 P.2d at 1245-46. In contrast, as discussed below, the order at issue here resulted from the trial court's exhaustive effort, based on application of the pertinent factors set forth in *Gila River II*, to determine "whether the well is pumping water that is more closely associated with the stream than with the surrounding alluvium." *Id.* at 392, 857 P.2d at 1246.

III. PROCEEDINGS AND ORDER AFTER REMAND

¶ 13 On remand, the trial court held a ten-day evidentiary hearing, during which ten experts in the fields of geology and hydrology testified. The court also spent two days traveling almost 600 miles in the San Pedro River basin. A "large number of counsel" and several experts accompanied the court on that trip. At each of the thirteen sites visited, each expert was allowed to explain the geology and hydrology of the site. In its order, the trial court noted that a transcript prepared from audio tapes made on the trip "is 258 pages because at nearly every site discussion was lengthy, often at odds, and sometimes heated." In addition, statements were taken from several long-time residents of the valley "who were witnesses to facts of historical significance with regard to the river." Four months after the field trip, the trial court held a two-day supplemental evidentiary hearing, the purpose of which was to evaluate "any changes in the location or size of the principal channel of the river or the

riparian vegetation areas adjacent to the river," as shown in aerial photographs taken fifty-five years apart.

¶ 14 In its order after remand, the trial court stated:

> [T]his Court has reviewed all of the testimony given, all of the exhibits, participated fully in the field trip and read all of the briefs. It also re-examined the testimony and exhibits of the 1987 evidentiary hearing on the relationship of groundwater to surface water. It finds a sufficient foundation of facts needed to rule on the issues presented.

The comprehensive, detailed order itself confirms those statements. It is sixty-six pages long, with thirty-six additional pages of exhibits. The order and the record as a whole clearly reflect that the trial court allowed the parties to fully present evidence and to advocate their positions and thoughtfully considered the complex issues presented here.[3]

IV. DISCUSSION

A. Definition of subflow zone

¶ 15 Although "subflow" is a purely legal, not scientific, term, defining its boundaries is not only difficult at best but also turns ultimately on resolution of factual questions. We, of course, must defer to the trial court's factual findings as long as the record supports them. *See* Ariz. R. Civ. P. 52(a), 16 A.R.S. ("Findings of fact . . . shall

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[3] The record includes not only transcripts of the evidentiary hearings, but also numerous reports, drawings, charts, and other exhibits.

not be set aside unless clearly erroneous, and due regard shall be given to the opportunity of the trial court to judge the credibility of witnesses."); *Scottsdale Unified Sch. Dist. No. 48 v. KPNX Broadcasting Co.*, 191 Ariz. 297, ¶ 20, 955 P.2d 534, ¶ 20 (1998).

¶ 16 The trial court's order describes in detail the evidence presented at the hearings and fully explains the reasons for its conclusions. Moreover, the record reflects that the court based its ruling on evaluation of the pertinent factors set forth in *Gila River II* for delineating the subflow zone. For example, the order states:

> After consideration of flow direction, water level elevation, the gradation of water levels over a stream reach, the chemical composition if available, and lack of hydraulic pressure from tributary aquifer and basin fill recharge which is perpendicular to stream and "subflow" direction, the Court finds the most accurate of all the markers is the edge of the saturated floodplain Holocene alluvium.

¶ 17 The trial court found that the younger Holocene alluvium "is the only stable geologic unit which is beneath and adjacent to most rivers and streams, except those in the mountains where bedrock surrounds the flow." The court then elaborated:

> Also, in order to fulfill the definition of "subflow," the geologic unit must be saturated because of the need for a hydraulic connection between the stream and the "subflow." Further definition requires "subflow" to be a part of the surrounding floodplain of the stream basin. Those parts of the alluvial plain which it may be a part of or which it is connected to must be the

alluvial plain of a perennial or intermittent stream and *not* an ephemeral stream or a part of the alluvial plain of a tributary aquifer even if there is an alluvial connection. Where the alluvial plain of tributary aquifers or ephemeral streams connects to the floodplain Holocene alluvium of the stream itself and provides tributary or basin fill recharge, that tributary aquifer must also be excluded because its flow direction is different and often perpendicular to the stream-flow direction.

The evidence here shows that the only true geologic unit which is beneath and adjacent to the stream is the floodplain Holocene alluvium. When it is saturated, that part of the unit qualifies as the "subflow" zone, where the water which makes up the saturation flows substantially in the same direction as the stream, and the effect of any side discharge from tributary aquifers and basin fill is overcome or is negligible. Because low-flow streams like the San Pedro meander back and forth in a series of "S" curves within a wider principal or dynamic channel, flow direction must be the general overall direction of the stream. As [DWR expert] Steve Erb testified, as long as the subflow's direction is within 45 degrees of that general stream flow direction, the flow direction requirement is met.

If we add the following additional criteria, then even more certainty and reliability is provided. *First*, the water level elevation of the "subflow" zone must be relatively the same as the stream flow's elevation. *Second*, the gradient of these elevations for any reach must be comparable with that of the levels of the stream

> flow. *Third,* there must be no significant difference in chemical composition that cannot be explained by some local pollution source which has a limited effect. *Fourth,* where there are connecting tributary aquifers or floodplain alluvium of ephemeral streams, the boundary of the "subflow" zone must be at least 200 feet inside of that connecting zone so that the hydrostatic pressure effect of the side recharge of this tributary aquifer is negligible and the dominant direction of flow is the stream direction. *Fifth,* where there is a basin-fill connection between saturated zones of the floodplain Holocene alluvium and a saturated zone of basin fill, the boundary of the "subflow" zone must be 100 feet inside of the connecting zone so that the hydrostatic pressure effect of the basin-fill's side discharge is overcome and the predominant direction of flow of all of the "subflow" zone is the same as the stream's directional flow. . . .
>
> The weight of the evidence points to the saturated floodplain Holocene alluvium as the most credible "subflow" zone. Its lateral and vertical limits have existed for some 10,000 or more years. It has far more stability of location than any other proposal including the principal channel which changes approximately every three years, or the post-1880 depositional layer which is really "post-1937" at best, or "post-1955" as indicated in the Hereford Report. . . .

¶ 18 In sum, the trial court complied with *Gila River II* by applying the factors set forth therein to the various theories advanced by the parties. The court ultimately concluded:

1. A "subflow" zone is adjacent [to] and beneath a perennial or intermittent stream and not an ephemeral stream.

2. There must be a hydraulic connection to the stream from the saturated "subflow" zone.

3. Even though there may be a hydraulic connection between the stream and its floodplain alluvium to an adjacent tributary aquifer or basin-fill aquifer, neither of the latter two or any part of them may be part of the "subflow" zone.

4. That part of the floodplain alluvium which qualifies as a "subflow," beneath and adjacent to the stream, must be that part of the geologic unit where the flow direction, the water level elevations, the gradations of the water level elevations and the chemical composition of the water in that particular reach of the stream are substantially the same as the water level, elevation and gradient of the stream.

5. That part of the floodplain alluvium which qualifies as a "subflow" zone must also be where the pressure of side recharge from adjacent tributary aquifers or basin fill is so reduced that it has no significant effect on the flow direction of the floodplain alluvium. . . .

6. Riparian vegetation may be useful in marking the lateral limits of the "subflow" zone[,] particularly where there is observable seasonal and/or diurnal variations in stream flow caused by transpiration. However, riparian vegetation on alluvium of a tributary aquifer or basin fill cannot extend the limits of the "subflow" zone outside of the lateral limits of the saturated floodplain Holocene alluvium.

> 7. All wells located in the lateral limits of the "subflow" zone are subject to the jurisdiction of this adjudication no matter how deep or where these perforations are located. However, if the well owners prove that perforations are below an impervious formation which preclude[s] "drawdown" from the floodplain alluvium, then that well will be treated as outside the "subflow" zone.
>
> 8. No well located outside the lateral limits of the "subflow" zone will be included in the jurisdiction of the adjudication unless the "cone of depression" caused by its pumping has now extended to a point where it reaches an adjacent "subflow" zone, and by continual pumping will cause a loss of such "subflow" as to affect the quantity of the stream.

¶ 19 As they did in the trial court, most of the groundwater users urge us to limit the subflow zone to the post-1880 entrenchment channel, which resulted from a process in which a stream eroded downward so as to form a trench. The entrenchment channel is part of and lies within the younger alluvium. According to the groundwater users, that channel extends downward to the vertical boundary of the post-entrenchment alluvium and is laterally narrower than the younger alluvium.

¶ 20 Relying primarily on the testimony of their principal expert, Dr. Errol Montgomery, the groundwater users contend the post-1880 entrenchment channel is a well-known, well-documented, and easily identifiable geological unit found throughout the Southwest and is the only reliable marker of the subflow zone. They argue that only that channel satisfies *Gila River II* because it is

more closely related to the stream than to the surrounding alluvium, it transports underground water beneath and immediately adjacent to the surface stream, and pumping from it has a direct and appreciable impact on the stream flow.

¶ 21 The trial court rejected the post-1880 entrenchment channel and other alternative proposals for defining the subflow zone.[4] Those who urge the post-1880 entrenchment channel as the most appropriate subflow zone essentially contend that the weight of the evidence supported that result and that the trial court misinterpreted the evidence in rejecting it.

¶ 22 We note, however, that Montgomery testified that his master's thesis did not even mention or map the post-1880 entrenchment area because it would not be "called out" in most geological investigations that address the principal geological units. Rather, Montgomery stated, "it's only for special purposes, special studies that a unit like the post-1880 would be delineated." He also expressed doubt that DWR would be able to recognize the distinction. Montgomery further testified that "the boundary that can be recognized below the subsurface is going to be the boundary between the Holocene alluvium and the basin fill deposits, because there's not

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[4] Some groundwater users proposed that the subflow zone be defined by the banks or edge of the stream's principal channel. And, The Nature Conservancy proposed, inter alia, that the subflow zone should be defined by the riparian zone, that is, the geographic area that phreatophytes had occupied in predevelopment times. The trial court rejected those proposals.

only a lithologic or textural change there, but there's a cementation change."

¶ 23 In addition, other expert testimony refuted the reliability of the post-1880 entrenchment as the designation of subflow zone. For example, Steve Erb of DWR testified that, although any of the proposals presented to the trial court might possibly satisfy this court's criteria in *Gila River II*, the younger alluvium is as close as anything to a natural boundary where subflow occurs. He further testified that DWR anticipated difficulty in identifying a subflow zone based on post-1880 entrenchment due to the lack of lithologic distinction between the ages of the younger alluvium. Similarly, Allen Gookin, who testified on behalf of the Gila River Indian Community, recommended not using the post-1880 entrenchment channel as the defining marker for subflow zone because (1) it does not occur throughout the entire Gila River basin, (2) movement of rivers over time would demand redefinition and redetermination of subflow zone on a continuing basis, and (3) there is no geological difference between the channel and the rest of the younger alluvium.

¶ 24 Moreover, the groundwater users conceded at oral argument, and the record reflects, that sufficient evidence supports the trial court's factual findings, which adopted the saturated floodplain Holocene alluvium as the subflow zone.[5] Thus, the groundwater users' argument largely boils down to a disagreement with the trial

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[5] Specifically, the record, including expert testimony and reports admitted at the hearing on remand, reflects the following:

court's resolution of disputed facts and conflicting expert opinions. Such issues, however, are solely and peculiarly within the province of the trial court.

A. The saturated floodplain Holocene alluvium has a definable bed and banks and has current from the flow of underground water in response to gradient.

B. The methodology and procedure for delineating the subflow zone are not based on volume or time, but rather, on a geological feature that is a distinct, mapable, geological unit.

C. The saturated floodplain Holocene alluvium is more closely related to the stream than to surrounding alluvium, exists immediately adjacent to and beneath the stream bed, and does not extend from ridge line to ridge line. It is in direct hydraulic connection with the surface stream.

D. The groundwater table elevation in the saturated floodplain Holocene alluvium is at or near the surface of the stream.

E. Gradient and flow direction within the saturated floodplain Holocene alluvium generally are more closely associated with the river than with surrounding aquifers. The boundaries of the subflow zone set by the trial court are adequate to eliminate from the equation areas of connecting tributary aquifers, floodplain alluvium of ephemeral streams, or saturated basin fill.

F. The chemical composition of surface water and of water contained in the saturated floodplain Holocene alluvium is virtually identical.

G. Using the saturated floodplain Holocene alluvium for identifying subflow zone is not arbitrary, but rather, is scientifically based on geology and associated aquifer characteristics.

¶ 25 The parties presented conflicting evidence, including expert opinions, to support their theories relating to subflow and its parameters. The trial court, not this court, weighs the evidence and resolves any conflicting facts, expert opinions, and inferences therefrom. *In re Estate of Pouser*, 193 Ariz. 574, ¶ 13, 975 P.2d 704, ¶ 13 (1999). The record reflects that the trial court carefully and thoroughly performed those functions and then made findings that, although disputed, are fully supported by the evidence. Under these circumstances, we will not second-guess the court's factual findings, but rather, will uphold them unless they are shown to be clearly erroneous. *See* Ariz. R. Civ. P. 52(a). No such showing has been made here.

¶ 26 As they did in *Gila River II* with respect to the 50%/90 day rule, the groundwater users also contend the trial court's order after remand "is wrong as a matter of law" because its definition of subflow is too broad and is incompatible with *Gila River II* and *Southwest Cotton*. In support of that argument, they point to language in those opinions variously describing subflow as underground water that is " 'a part of the surface stream,' " 175 Ariz. at 387, 857 P.2d at 1241, *quoting Southwest Cotton*, 39 Ariz. at 96, 4 P.2d at 380; " 'found within, or immediately adjacent to, the bed of the surface stream itself,' " 175 Ariz. at 387, 391, 857 P.2d at 1241, 1245, *quoting Southwest Cotton*, 39 Ariz. at 97, 4 P.2d at 381; " 'connected with the stream[,] . . . strictly confined to the river bottom and moving underground' " " 'within the bed of the surface stream itself,' " 175 Ariz. at 390, 857 P.2d at 1244, *quoting* Kinney, *supra* § 1161, at 2110; and "relatively close to the stream bed." 175 Ariz. at 391, 857 P.2d at 1245. According

to the groundwater users, the trial court's adoption of the saturated floodplain Holocene alluvium as the subflow zone cannot be squared with those prior pronouncements.

¶ 27 As the groundwater users correctly observe, this court "adopted [Kinney's] narrow definition [of subflow] in *Southwest Cotton*," *Gila River II*, 175 Ariz. at 390, 857 P.2d at 1244, and again characterized subflow as "a narrow concept" in *Gila River II*. *Id.* at 391, 857 P.2d at 1245. Although those abstract, general statements hold true, we also observed in *Gila River II* that variations may affect where the line is drawn between subflow and nonappropriable percolating water, "depending on the volume of stream flow and other variables." *Id.* Thus, defining subflow in any particular area is a relative endeavor, "not an all-or-nothing proposition." *Id.* And, although "the line between surface and groundwater . . . is, to some extent, artificial and fluid," *id.* at 392, 857 P.2d at 1246, our various descriptions of subflow in *Gila River II* and *Southwest Cotton* should not serve as a straitjacket that restricts us from reaching in the direction of the facts and, so far as possible under those decisions, conforming to hydrological reality.

¶ 28 Our dissatisfaction with the 50%/90 day test in *Gila River II* stemmed largely from its arbitrary volume and time components, contrary to *Southwest Cotton*'s mandate to define subflow "in terms of whether the water at issue was part of the stream or was percolating water on its way to or from the stream." *Gila River II*, 175 Ariz. at 392, 857 P.2d at 1246. The 50%/90 day test included no such inquiry, as the trial court acknowledged in its subsequent order after remand: "A review of the

exhibits and testimony of [the 1987] hearing reflects the issue of "subflow" or how it could be physically located was *not* the focus of those hearings. Rather, it was a hearing as to the general relationship of surface flow to groundwater of all types." The court further stated that, "[w]hile [*Gila River II*] is correct in that there was no substantial evidentiary basis for [the 50%/90 day rule], the reason for it was that the 1987 hearings did not focus on 'subflow.' "

¶ 29 In contrast, the trial court's order after remand stated: "In dealing with the issue of 'subflow' as raised in 'Southwest Cotton,' the hearings held in . . . 1994 specifically focused on it. All [the] testimony related directly to that issue and the issue of 'cones of depression.' " The voluminous record confirms those statements.

¶ 30 The resolution of this case should not hinge on the semantics used in either *Gila River II* or *Southwest Cotton* to generally describe subflow. In short, those decisions were not intended to establish hard and fast, artificial parameters for subflow based solely on its geographic reach or on some arbitrary distance from a streambed. *See Southwest Cotton,* 39 Ariz. at 87, 4 P.2d at 377 (factors relevant to determining subflow include "geologic formation"); *City of Los Angeles v. Pomeroy,* 124 Cal. 597, 57 P. 585, 598 (1899) (facts supported jury finding that underground water flowing through a pass one and one-half to two and one-half miles wide constituted subflow), *cited with approval in Southwest Cotton,* 39 Ariz. at 97-99, 4 P.2d at 381. Rather, as we stated in *Gila River II,* the determination of whether a particular well is pumping subflow depends on "whether the well is pumping water that is more closely associated with the stream than

with the surrounding alluvium," 175 Ariz. at 392, 857 P.2d at 1246, and whether " *'drawing off the subsurface water tend[s] to diminish appreciably and directly the flow of the surface stream.'* " *Id.* at 393, 857 P.2d at 1247, *quoting Southwest Cotton*, 39 Ariz. at 97, 4 P.2d at 380. That determination, in turn, necessitates a comparative evaluation of such factors as "elevation, gradient, [flow direction,] and perhaps chemical makeup." *Gila River II*, 175 Ariz. at 392, 857 P.2d at 1246.

¶ 31 Using those pertinent criteria, the trial court held extensive evidentiary hearings for the purpose of "separating appropriable subflow from percolating groundwater," 175 Ariz. at 394, 857 P.2d at 1248, with the ultimate aim of establishing a workable and reasonably accurate definition of subflow.[6] Resolution of that issue was necessarily fact intensive. As noted above, the record reflects, and the parties now concede, that sufficient evidence supports the trial court's factual findings.

¶ 32 Unlike the 50%/90 day test we rejected in *Gila River II*, the trial court's order after remand is not arbitrary. Nor does it include tributary aquifers in its definition of subflow. Although the saturated floodplain Holocene alluvium may appear to be inconsistent with the "narrow concept" of subflow described in *Gila River*

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[6] Contrary to the suggestion of some of the parties at oral argument, the trial court did not exceed the scope of this court's remand in *Gila River II*. We specifically instructed the court to "take evidence" and "apply[ ] the principles contained" in *Gila River II* for purposes of "separating appropriable subflow from percolating groundwater." 175 Ariz. at 394, 857 P.2d at 1248. We did not intend to limit the trial court to merely determining useful criteria for that task.

II, 175 Ariz. at 391, 857 P.2d at 1245, and suggested in *Southwest Cotton*, we reject the argument that the trial court's findings and conclusions, as a matter of law, so violate the fundamental principles of those cases that they cannot stand. Nor does affirmance of the trial court's order require us to overrule *Gila River II* or *Southwest Cotton*, and we do not do so.

¶ 33 At oral argument, the groundwater users questioned how the "saturated" younger alluvium is to be defined and identified and what role, if any, the criteria that we set forth in *Gila River II* and that the trial court used will play in determining subflow in different locations. The criteria that the trial court articulated were elaborations of, but consistent with, the more general criteria set forth in *Gila River II*. The trial court properly applied these criteria to the San Pedro River basin in order to determine the most appropriate subflow zone, and the weight of the evidence supports the trial court's identification of that zone as the "saturated" floodplain Holocene alluvium.

¶ 34 The record reflects that the saturated floodplain Holocene alluvium is readily identifiable; that DWR can quickly, accurately, and relatively inexpensively determine the edge of that zone; and that some of the work already has been done. For example, the Salt River Project's (SRP) expert, Jon Ford, presented a proposal that identified subflow for the entire San Pedro River watershed and conducted a field check of his map to refine the boundaries. DWR may use such data accumulated during these proceedings to aid in its task. DWR also may use, but is not limited to, topographic maps, aerial photographs, phreatophyte presence, drilling records (or other

descriptions of materials encountered during drilling), water table maps, seismic data, and field mapping techniques.

¶ 35 The entire saturated floodplain Holocene alluvium, as found by DWR, will define the subflow zone in any given area.[7] In the effort to determine that zone in other areas, the detailed criteria set forth in the trial court's order, insofar as they apply and are measurable, must be considered, but we do not preclude the consideration of other criteria that are geologically and hydrologically appropriate for the particular location.

¶ 36 Contrary to the groundwater users' argument, the saturated floodplain Holocene alluvium does not automatically or necessarily encompass the entire younger alluvium. Equating the two would fail to take into account the pertinent criteria that must be applied and satisfied for determining the "saturated" subflow zone in a particular area. *See Southwest Cotton*, 39 Ariz. at 96, 4 P.2d at 380 (noting that "the water from the surface stream must necessarily fill the loose, porous material of its bed to the point of complete saturation before there can be any surface flow"). It also would conflict with our rejection in *Gila River II* of any unqualified, blanket rule that invariably would include "all of an alluvial valley's wells" or all "waters pumped any place in the younger alluvium" in the definition of subflow. 175 Ariz. at 391, 393, 857 P.2d at 1245, 1247. But, contrary to the groundwater users' argument that the trial court's definition of

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[7] According to Erb, DWR does not include as part of a floodplain aquifer any area where the floodplain alluvium is above the water table.

subflow is broader than *Gila River II* and *Southwest Cotton* permit, the record reflects that saturated floodplain Holocene alluvium occupies only very narrow portions of the alluvial basins.

¶ 37 Moreover, as Ford explained and as the trial court acknowledged, the Holocene or floodplain alluvium is only the most recent portion of "stream alluvium." The entire younger alluvium is of Quaternary age, which includes materials deposited during both the Pleistocene era (approximately 1.8 million to 10,000 years ago) as well as the Holocene era (approximately the past 10,000 years to date).[8] And, as Montgomery acknowledged, modern floodplain alluvium underlies and is adjacent to nearly all large streams. Finally, the trial court's order does not preclude, but rather contemplates, future adoption of "a rationally based exclusion for wells having a de minimus effect on the river system," an approach we continue to endorse. *Gila River II*, 175 Ariz. at 394, 857 P.2d at 1248. *See also San Carlos Apache Tribe v. Superior Court*, 193 Ariz. 195, ¶¶ 35-40, 972 P.2d 179, ¶¶ 35-40 (1999).

B. Cones of depression

¶ 38 The trial court's order limits the subflow zone to the saturated floodplain Holocene alluvium. Thus, wells outside that area are presumed not to be pumping subflow. The trial court ruled, however, that "[w]ells located outside the lateral parameters of the defined 'subflow'

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[8] According to Montgomery, Holocene describes material deposited during approximately the last 8,000 years.

zone" may be included in the adjudication if "it is proven that their 'cones of depression'[9] reach the 'subflow' zone and the drawdown from the well affects the volume of surface and 'subflow' in such an appreciable amount that it is capable of measurement." In other words, the trial court ruled, a well may be subject to the adjudication if its " 'cone of depression' caused by its pumping has now extended to a point where it reaches an adjacent 'subflow' zone, and by continual pumping will cause a loss of such 'subflow' as to affect the quantity of the stream."

¶ 39 The trial court did not attempt to establish a test for determining a well's cone of depression because the court lacked pertinent evidence on that issue. Instead, the court recognized that each well must be separately evaluated "to compute drawdown at the 'subflow' zone" and that "whatever test ADWR finds is realistically adaptable to the field and whatever method is the least expensive and delay-causing, yet provides a high degree of reliability, should be acceptable."

¶ 40 We agree with the trial court. DWR may seek to establish that a well located outside the limits of the saturated floodplain alluvium is in fact pumping subflow and is therefore subject to the adjudication, by showing that the well's cone of depression extends into the subflow zone and is depleting the stream. And, as we stated in *Gila River II*, although a cone of depression may result in only part of a well's production being appropriable

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[9] The cone of depression is the funnel-shaped area around a well where the withdrawal of groundwater through the well has lowered the water table. *Gila River II*, 175 Ariz. at 391 n. 10, 857 P.2d at 1245 n. 10.

subflow, "that well should be included in the general adjudication." 175 Ariz. at 391, 857 P.2d at 1245.

C. Burdens of proof

¶ 41 The trial court's order and the parties' briefs addressed the standard of proof a well owner must meet to rebut DWR's assessment that a well is pumping subflow. As noted in ¶ 6 above, a well pumping underground water is presumed initially to be pumping percolating groundwater, not appropriable subflow. When DWR determines and establishes that a well is in the subflow zone by using the pertinent criteria or that it is pumping subflow by reason of its cone of depression, DWR provides clear and convincing evidence of that fact. *See Gila River II*, 175 Ariz. at 392, 857 P.2d at 1246. The burden then shifts to the well owner to show that a well is either outside the subflow zone or is not pumping subflow. *Id.*

¶ 42 In its order after remand, the trial court stated that, "[a]t least in the area of 'cones of depression[,]' a burden of proof of preponderance seems fairer. The same is probably also true in the area of a 'subflow' zone determination." The court noted that, in determining cones of depression, experts "often rel[y] on assumptions which are not provable or are only partially provable" and that a clear and convincing standard for rebuttal purposes probably would be "too formidable a barrier" for pro se parties and often would be "too much for represented parties of modest wealth."

¶ 43 Given the strong initial presumption that a well is pumping percolating groundwater, we agree with the trial court that a preponderance of the evidence standard is more appropriate and should apply to well owners' efforts to rebut DWR's determination that a well is pumping subflow.[10] If a well owner presents sufficient evidence to meet that standard, it necessarily reduces DWR's proof to something less than clear and convincing.

D. Other Issues

¶ 44 We summarily dispose of the parties' remaining arguments relating to the trial court's determination of subflow. In *Gila River II*, we stated that " '[r]egulation of water use,' " enactment of appropriate laws for the " 'wise use and management' " of water, and effecting "any appropriate change in existing law" to accommodate "conflicting interests and claims of groundwater users and surface appropriators," are peculiarly legislative functions. 175 Ariz. at 393, 857 P.2d at 1247, *quoting Arizona Pub. Serv. Co. v. Long*, 160 Ariz. 429, 436, 773 P.2d 988, 995 (1989). Based on that language, the groundwater users and the state contend that judicially redefining subflow to encompass percolating, nonappropriable groundwater violates those principles by improperly usurping the legislative role. That argument, however, overlooks three basic points.

¶ 45 First, for nearly seven decades, this court has established the parameters of subflow without legislative

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[10] We did not state or suggest otherwise in *Gila River II*.

action or direction. Second, as discussed above, the trial court did not change existing law concerning subflow or otherwise improperly encroach on the state's Groundwater Code, A.R.S. §§ 45-401 through 45-704. Rather, the court merely applied the criteria set forth in *Gila River II* to the evidence presented on remand. As SRP correctly notes, the trial court's order "addresses only appropriable water and wells that pump such water," without "chang[ing] the legal status of underground water that is not appropriable." Third, this court must decide issues that are squarely presented to it, particularly when, as here, the trial court, at the parties' request, specifically certified the questions raised in this matter. *See San Carlos Apache Tribe*, 193 Ariz. 195, ¶ 37, 972 P.2d 179, ¶ 37 ("The power to define existing law, including common law, and to apply it to facts rests exclusively within the judicial branch.").

¶ 46 Given the over quarter-century history of, and specific statutory authorization for, this complex general stream adjudication, *see id.* at ¶ 2, 193 Ariz. 195, 972 P.2d 179, ¶ 2, the judiciary clearly is not only empowered but also expected to determine, based on a complete evidentiary record, issues relating to subflow. Resolution of such issues is integral to our statutorily recognized role of determining "the nature, extent and relative priority of the water rights of all persons in the river system and source." A.R.S. § 45-252(A). That function, in turn, includes identification of "waters of all sources, flowing in streams, . . . other natural channels, or in definite underground channels" that "are subject to appropriation and beneficial use." § 45-141(A). *See also* § 45-251(7). In sum, this is not an area in which we must await or

necessarily defer to legislative action. *Cf. Law v. Superior Court*, 157 Ariz. 147, 155, 755 P.2d 1135, 1143 (1988) ("We are furthering the statutory objectives in this area, not contradicting them.").

¶ 47 We also reject the groundwater users' assertion that the trial court's order amounts to an unconstitutional taking of their private property, in violation of the Fifth Amendment. In remanding this matter in *Gila River II* for the trial court to establish an evidentiary and principled basis for differentiating appropriable subflow from percolating groundwater, we implicitly rejected the groundwater users' identical argument in that case. Moreover, because a well owner does not own underground water, *Town of Chino Valley v. City of Prescott*, 131 Ariz. 78, 82, 638 P.2d 1324, 1328 (1981), and because landowners have "no legally recognized property right in potential, future groundwater use," *Gila River I*, 171 Ariz. at 239, 830 P.2d at 451, the constitutional argument is substantively without merit.

V. CONCLUSION

¶ 48 We affirm the trial court's order after remand in all respects. The subflow zone is defined as the saturated floodplain Holocene alluvium. DWR, in turn, will determine the specific parameters of that zone in a particular area by evaluating all of the applicable and measurable criteria set forth in the trial court's order and any other relevant factors. *See* ¶¶ 33-35, *supra*. All wells located within the lateral limits of the subflow zone are subject to this adjudication. In addition, all wells located outside the subflow zone that are pumping water from a stream

or its subflow, as determined by DWR's analysis of the well's cone of depression, are included in this adjudication. Finally, wells that, though pumping subflow, have a de minimis effect on the river system may be excluded from the adjudication based on rational guidelines for such an exclusion, as proposed by DWR and adopted by the trial court.

CONCURRING: THOMAS A. ZLAKET, Chief Justice, STANLEY G. FELDMAN, Justice, WILLIAM E. DRUKE, Judge, and NOEL FIDEL, Judge.

Vice Chief Justice Charles E. Jones and Justices Frederick J. Martone and Ruth V. McGregor recused themselves; pursuant to Ariz. Const. art. VI, § 3, Judge Noel Fidel of Division One, Arizona Court of Appeals, Judge William E. Druke, and Judge John Pelander of Division Two, Arizona Court of Appeals, were designated to sit in their stead.

APPENDIX B

SUPERIOR COURT OF ARIZONA
MARICOPA COUNTY

HON. STANLEY Z. GOODFARB

June 30, 1994

N W-1, W-2, W-3, W-4

In re the General Adjudication of All Rights to Use Water in the Gila River System and Source

ORDER

THE NATURE OF THESE PROCEEDINGS

On July 27, 1993 the Arizona Supreme Court decided *In re the General Adjudication of All Rights to Use Water in the Gila River System and Source,* 175 Ariz. 382, 857 P.2d 1236 ("In re Gila") and remanded it back to this Court to make certain evidentiary decisions. That opinion was the second of six issues of law the Court accepted for interlocutory review on December 11, 1991. Those issues were accepted because this action, which adjudicates water rights under the McCarran Act, 43 USCS § 666 will be before the Courts for many years and is exceedingly complex.

Two issues were remanded. *First,* a test for use by the Arizona Department of Water Resources (ADWR) to

determine what is known as "subflow" under *Maricopa County Municipal Water Conservation District No. One v. Southwest Cotton*, 39 Ariz. 65, 4 P.2d 369 (1931) ("Southwest Cotton"). "Subflow" contains appropriable water under A.R.S. § 45-141 and, therefore, is subject to the jurisdiction of this Court under state law. In this Court's opinion, "In re Gila" requires that the "subflow" zone be defined by physical factors utilizing stable geologic formations, available hydrological information, and/or organic characteristics of the area. *Second*, a test for use as to wells outside the "subflow" zone which create such a "cone of depression," that they cause water to be lost to or removed from the "subflow" zone, the stress bed, or the stream itself.

The parties divide into two groups. The United States, Salt River Project, the Indian Tribes and the Nature Conservancy argue for a "subflow" zone as wide as possible and a "cone of depression" test which provides the greatest protection to stream flow. These parties have an interest in protecting their surface rights in stream flow because they already have appropriation rights or federal reserve rights under *Winters v. U.S.*, 207 U.S. 564, 28 S.Ct. 207, 52 L.Ed 340 (1908). Those who refer to themselves as the "groundwater users" include the mines, several cities who depend more heavily on groundwater sources, plus certain agricultural interests. They argue for a much narrower "subflow" zone, because it provides much more protection for their use of sub-surface water sources they depend on.

On August 27, 1993 this Court took up the issues presented and the resolution process. At least two of the

parties, Cyprus Mining and the City of Phoenix, previously presented requests for direction. A briefing schedule was set and request for comment on the issue with argument set for October 7, 1993. By then the Court had received a number of briefs which called for an evidentiary hearing. The Court agreed and provided certain specific orders to ADWR and others on how the evidentiary hearing would be held, how reports were to be prepared, how experts were to be presented and proposed dates and schedules.

On November 5, 1993 there was further discussion as to the contents of the experts' reports filed by December 15, 1993. The next meeting, December 10, 1993, changed the date of the evidentiary hearing from January 10, 1994, to January 31, 1994, spelled out what was expected from the parties as to testimony, and set rules on cross-examination by multiple parties and limits on evidentiary relevance.

On December 22, 1993 the Court held its first Pretrial Management Conference and set down four separate evidentiary rulings which the Court believed all parties were in agreement with, and noted what seemed to be the quality of the ten separate reports filed. The Court then requested an acetate overlay presentation of how each party's position would show the parameters of the "subflow" zone in two typical study reaches of the San Pedro Basin. They were Reach 1 between Reddington and Mammoth (exhibit 18), and Reach 2 Palominas (exhibit 11). The acetate overlays were mounted over base maps prepared by ADWR and marked as exhibits 12 to 17 for the Palominas Reach (exhibit 11), and exhibits 19 to 25 for the Reddington Mammoth Reach (exhibit 18).

On January 14, 1994 the final details were worked out, the requested exhibits presented, mounted and viewed by all counsel, a schedule of the order of witnesses' presentations arrived at and how cross-examination would be allowed. By then an exchange of exhibits was to have occurred. Between the 14th and the 31st, disclosure statements were filed by the City of Phoenix, Maricopa County, City of Tucson, City of Benson, Apache Nitrogen, Buckeye Irrigation, City of Tempe, Apache Tribes and the Verde Valley who did so to preserve their right of cross-examination but who did not intend to offer any expert testimony and had not submitted reports.

On January 27, 1994 the groundwater users filed a disclosure statement indicating for the first time a claim that the parameters of the "subflow" zone would be defined by the lateral limits of what they called the "post-1880 entrenchment" rather than what they reported previously in Dr. Montgomery's Report of December 14, 1994. During the ten days of the hearing the "post-1880 entrenchment" theory became the focal point of their position.

On Monday, January 31, 1994 this Court commenced ten days of evidentiary testimony taken from ten different geologists and hydrologists. March 3 and 4, 1994 were spent on a field trip to the San Pedro itself. (Two hundred eighteen exhibits were then received in evidence.) Before testimony started, two sides presented oral motions to exclude the other's testimony. The groundwater users requested exclusion of all testimony as to younger alluvium arguing that "In re Gila" precluded it. Salt River Project, the United States and the Tribes argued to

exclude any testimony as to the "post-1880 entrenchment" theory because it was revealed only two court days before the hearing. Both motions were denied for the reasons stated on the record.

Testimony started on January 31, 1994 with Jon R. Ford for Salt River Project who was followed by Dr. Thomas Maddock, III, of the University of Arizona for the Nature Conservancy, Oliver S. Page for the United States, and T. Allen Gookin for the Gila River Indian Community. Following them were Dr. Errol L. Montgomery and Dr. Stanley Schumm, a geomorphologist from Colorado State University, who presented the groundwater users' position. William Wellendorf, David Stephenson and Michael Lacey followed for certain cities on February 10, 1994. Testimony then ended on February 15, 1994 with two days of Steve Erb, Chief of the Adjudication Section of ADWR.

In the testimony it soon became apparent that almost none of the experts had done any recent physical investigation on the San Pedro. What they presented largely were literature searches and investigation of their own or others' prior reports. No drilling or soils investigation had occurred. The Court, based on its own prior experience as counsel for the Arizona Department of Transportation (ADOT), recalled that the materials division of ADOT keeps a detailed index of all soils investigation made for highways constructed, bridges built and materials pits utilized for its construction in every part of this state. Since there were highways all over the San Pedro Valley, the Court had ADWR contact ADOT and discovered that it had drill logs available for the two interstate highway bridges at Benson in the San Pedro River, the

bridge over the river at Charleston and the bridge at Lewis Springs. These were secured and copies made available to all parties for their use and interpretation. (These were marked as exhibits 236, 237, 238 and 239 and testified to extensively by Dr. Montgomery, Steve Erb and others). While a number of witnesses testified about opinions based upon well-driller logs of record at ADWR, after receiving the ADOT logs the United States, Salt River Project and groundwater users moved extensive drilling equipment into the area and drilled several sites in both the upper and lower reaches of the river. The information derived from these drilling programs plus interpretation of the ADOT drilling logs is contained in the rebuttal affidavits filed by Jon R. Ford, Oliver S. Page and Errol L. Montgomery. These were filed in lieu of further rebuttal testimony.

On March 3 and 4, 1994 the Court and a large number of counsel embarked on a two-day, 595-mile field trip covering the entire San Pedro Valley and visited more than 13 sites. There each expert was permitted to explain the geology and hydrology of the site. This was recorded by audio tape, transcribed and filed of record. It is 258 pages because at nearly every site discussion was lengthy, often at odds, and sometimes heated. The statements were first made by witnesses previously sworn at the hearings; but, by consent, statements were also taken from others including several long-time residents who were witnesses to facts of historical significance with regard to the river. These were Jack Smallhouse, a rancher in the area of Reddington whose family resided and ranched the area since 1880; Barbara Clark, a resident at

Caschabel who had resided in the present location adjacent to the river for about twenty years; and Ben Lomeli, a hydrologist for BLM who is a ranger for the San Pedro River Riparian Conservation Area. A detailed discussion of the trip is contained in this court's minute entry of March 11, 1994.

At the conclusion of the hearing on February 15, 1994, the Court established a schedule for briefing. Principal lead counsel were to file their briefs by March 18, 1994. Others were to reply by March 25, 1994. After this was done, the groundwater users filed a Motion to File a Reply Brief and a request for oral argument. Salt River Project and the United States moved to strike and deny. The Court allowed those late briefs to stand but denied oral argument. More than enough had been said and written.

Later, as will be explained on pages 39 to 42 of this decision, it became necessary that a supplementary evidentiary hearing be held. It related to a comparison of aerial photography of the San Pedro River taken in 1935 and 1990. When this Court became aware of this material, it asked ADWR to carry out a study comparing the physical features of the river shown on this aerial photography which was taken fifty-five years apart. The request was to look for any changes in the location or size of the principal channel of the river or the riparian vegetation areas adjacent to the river. This hearing occurred on June 14 and June 15, 1994. Four witnesses were heard from and 83 additional exhibits were admitted.

Prior to and since that hearing this Court has reviewed all of the testimony given, all of the exhibits,

participated fully in the field trip and read all of the briefs. It also re-examined the testimony and exhibits of the 1987 evidentiary hearing on the relationship of groundwater to surface water. It finds a sufficient foundation of facts needed to rule on the issues presented. Because one of the criticisms of this Court's prior instruction to ADWR on the "50%/90-day" rule was a lack of evidentiary record to support it, this order will be necessarily lengthy.

THE REASONING PROCESS WHICH LED US HERE

Having discussed the nature of the proceedings from July 27, 1993 to date, it should help to understand the decision which follows to review the thought processes which brought us here.

This McCarran Act adjudication began as a judicial process in 1979. It combines an adjudication of rights under Arizona law of prior appropriation for surface water sources, "Southwest Cotton," with the non-prescriptive right under state law to reasonable use of groundwater, *Bristor v. Cheatham*, 75 Ariz. 227, 255 P.2d 173 (1953), with federal law on the rights of federal entities and Indian tribes to use both surface and groundwater for the purpose of the federal entity and/or reservation creation. *Cappaert v. U.S.*, 420 U.S. 128, 965 Ct. 2062, 48 L.Ed.2d 523 (1978). It must deal not only with rights derived from actual use under state law, but with priorities of rights reserved to federal entities and reservations under federal law because the United States is not only the owner but the Trustee of those lands, *Winters v. U.S.*, supra.

Unfortunately, from 1979 to 1983 this case was involved in a jurisdictional dispute which was not resolved until 1983 in *Arizona v. San Carlos Apache Tribe of Arizona*, 463 U.S. 545, 103 S.Ct. 3201, 72 L.Ed.2d 837 (1983). After that, it took a great deal of time to bring the Hydrographic Survey Report (HSR) activities of ADWR to the point where the voluminous reports needed could be readied for judicial analysis and decision. Considering the size of the Gila watershed, its numerous sub-watersheds, the number of claimants (approximately 24,000), and the diversity of interests, that should not be surprising. While the investigation for the reports was being carried out and reports prepared, the Court, in order to use its time efficiently, attempted to hear and decide major issues which were not factually oriented. As a result, the Court issued a series of pretrial management orders and decisions including the ruling of September 9, 1988 which included the "50%/90-day" rule. As stated in "In re Gila," P. 384 of 175 Ariz:

> "For five days in October, 1987, the trial court held hearings on the relationship between surface water and groundwater. Hydrologists and hydrological engineers testified and submitted reports on the relation between ground and surface water in general, and in the San Pedro and Santa Cruz watersheds in particular. The hearings were for the general education of all parties and the court, but the material adduced at the hearing was to be considered evidence on which the court could rely when appropriate."

A review of the exhibits and testimony of that hearing reflects the issue of "subflow" or how it could be physically located was *not* the focus of those hearings.

Rather, it was a hearing as to the general relationship of surface flow to groundwater of all types. Then, and even at this latest hearing, the consensus of all testimony was that there is a hydraulic connection between nearly all groundwater and the surface flow in its area except where: 1) a confined aquifer is sealed off from surrounding basin fill or floodplain alluvium by substantial impervious layers such as clay which precludes the connection; or, 2) a groundwater aquifer is beneath an ephemeral stream and the "vadose" dry zone between the stream and the top of the aquifer substantially precludes connection.

Following the 1987 hearings, several cities filed a motion to exclude certain wells from the adjudication arguing they pumped percolating groundwater rather than surface flow or "subflow" under "Southwest Cotton." It was at this point that the "subflow" issue first significantly arose in this case and the Court's instruction to ADWR on the "50%/90-day" rule was issued on September 9, 1988. While "In re Gila" is correct in that there was no substantial evidentiary basis for that instruction, the reason for it was that the 1987 hearings did not focus on "subflow."

In dealing with the issue of "subflow" as raised in "Southwest Cotton," the hearings held in January, February, March and June 1994 specifically focused on it. All its testimony related directly to that issue and the issue of "cones of depression."

Another fact needs to be recognized. On page 391 of 175 Arizona Reports, the following statement appears:

> "The trial court instructed DWR to apply the 50%/90 day test to all wells located in or near the younger alluvium. *The record shows, however, that in a given area the younger alluvium may stretch from ridge line to ridge line so that all wells in the valley would be in or near the younger alluvium.*" (emphasis supplied)

The position of the second sentence that "younger alluvium may stretch from ridge line to ridge line" is factually unsupported. Every witness who testified in this hearing agreed that "younger alluvium" "Holocene alluvium" or "floodplain alluvium" (different names for the same thing) is found only in the center of this broad valley. It does not come even close to the ridge line in the upper or lower basins of this valley. Those ridge lines constitute the top of the Huachuca and Whetstone Mountains to the west and the Dragoon and Mule Mountains to the east in the upper basin from the border to Pomerene. The valley in this area is a basin fifteen to twenty miles wide.

If one proceeds geologically from the ridge line of the mountains down toward the center of the valley one encounters first substantial rock face, then some distance from the top and generally at their base the edge of the basin fill deposits. These divide geologically into an upper and lower basin fill.

Moving further toward the center of the valley one encounters the edge of what this Court will call the floodplain alluvium near the center of the valley. It is made up of those deposits laid down since the end of the "Ice Age." Its width is up to 7,000 feet in the upper basin and much narrower in the lower basin which runs from

Pomerene north to Winkelman. There the ridge line is the top of Rincon and Tortilla Mountains to the west and the Winchester and Galloros to the east. The same geologic sequence of ridge line, rock face, basin fill, and finally floodplain alluvium is also found in the lower basin.

Most aquifer recharge occurs at the line of mountain front recharge. This is where the basin fill meets the rock face. It is generally thousands of feet below the ridge line and miles from the floodplain alluvium. The graphic portrayal which follows shows this relationship.

[Picture Omitted]

Figure 2-3. Generalized cross-section of aquifers systems.
Copy of Page 13 of Exhibit 10.

[Picture Omitted]

(Modified from ADWR, 1991)
Copy of figure 4 of Exhibit 2.

THE SAN PEDRO RIVER

While the issues to be decided pertain to watersheds all over the Gila River watershed, the facts as to the San Pedro River need to be discussed.

The San Pedro River Valley is in the basin and range portion of southeast Arizona. It is oriented from south to north and flows from Cananea, Sonora, Mexico, to Winkelman. The valley's elevation ranges from 9,500 feet at its mountain tops to 1,920 feet at Winkelman. At the international border it is at 4,275 feet and drops to 3,590 feet at

the narrows near Benson. In the United States the San Pedro River runs about 52 miles from the border to Benson and another 80 miles to Winkelman for a total of 132 miles. Its overall rate of drop is about 18 feet per mile but in the upper basin it is 13 feet per mile and 20 feet per miles in the lower basin.

According to the HSR prepared by ADWR, Table 4-12, the river naturally and normally produces approximately 160,000 acre feet of surface water per year. Approximately 64,000 acre feet is used by various cultural uses such as irrigation, mining, domestic, municipal, etc. Another 5,620 acre feet is lost to evaporation and 52,000 acre feet is used by the phreatophytes such as willow, cottonwood and mesquite which make up its riparian forests. This leaves about 58,000 acre feet of outflow both by groundwater and surface water at Winkelman into the Gila River system after recharge and return from some of the cultural and natural uses. Dr. Montgomery, in his October 2, 1987 Report for the earlier hearing (exhibit 11 of that hearing), reported on page 2 that the lower basin of the San Pedro alone had water storage capacity of 30 million acre feet in its aquifers. ADWR estimated in the HSR that the storage capacity of the San Pedro Aquifer both upper and lower was 84 million acre feet. Attached as Appendix A is that portion of this river's HSR which estimates its groundwater storage capacity by sub-watersheds and in total. Also attached is the water balance portion of the HSR and the aquifer storage estimate (Appendix B and C-1, C-2, C-3). In comparing these capacities to what appears to be a relatively low surface flow component, it is clear this

river value as a water asset is largely in its storage capacity rather than its surface flow.

An important and unexpected bit of evidence in our case was exhibit 190, Geological Society of American monograph entitled "Entrenchment and Widening of the Upper San Pedro River, Arizona" written by Richard Hereford, a direct descendant of the founder of the town of Hereford. He provides an interesting history prior to development and post-development of the upper basin from the border to St. David. Basically what he reports is that prior to 1880 the San Pedro was a slow, swamp-like river running through various cienegas abundantly filled with large buffalo fish and beaver dams. The swamp-like conditions caused malaria in the early St. David settlements until breaching the beaver dams allowed the swamps to drain. The areas beside the river were large grassy plains with little riparian forestation. A picture of the bridge at Hereford in 1908 is shown on page 15 of exhibit 190. It shows no trees in the area and a large grassy plain next to a stream entrenched a few feet below the surface of the adjoining grasslands. On our field trip on March 3, 1994 we found a virtual forest of riparian growth nearly a mile wide.

Upper San Pedro River, Arizona

[Picture Omitted]

Figure 14. Photograph of the Hereford bridge in 1908 showing entrenched channel. View is upstream. Photograph from Bisbee Mining and Historical Museum.

Exhibit 190 page 15.

In Hereford's Report, page 19, there are pictures taken at the Palominas bridge in 1939 and 1991 which also show the very recent heavy phreatophyte forestation. The Court's recent visitation to the area indicated even heavier growth and a channel significantly narrower from that shown even in the 1991 photo. On March 3, 1994 the Court found a lengthy three-span highway bridge, but a channel so narrow that one could jump across it, as several did, lodged against the eastern span of the bridge in the two pictures (one taken in 1939 and the other in 1991) that follow.

(A)

[Picture Omitted]

Exhibit 190 page 19.

[Picture Omitted]

Figure 17. Palominas bridge; view is upstream. (A) Photograph taken in 1939 (from Special Collections, University of Arizona, Tucson); (B) 1991. Dense riparian vegetation has developed in the channel.

Exhibit 190 page 19.

The reports and testimony all indicate a vastly different river environment up to 1880. Thereafter, significant overgrazing of the grass cover, removal of most of the upland trees for mine and charcoal use, climatic changes, phreatophyte growth and even, it is claimed, an earthquake in Mexico drastically change this valley. The vast herds of cattle of the late 1800s and early 1900s stripped most of the grassland cover from the adjacent parts of the

lower basin allowing significant erosion and phreatophyte infestation. The climate changes and overgrazing helped change the river from a slow-moving, marsh, swamp, cienega-like environment to one where heavy flash floods through narrowed channels could cause deep entrenchment and deposition. However, as Hereford reports, this entrenchment occurred mostly at times of significant flood, and nearly all of the new deposition occurred post-1937.

> "The post entrenchment deposits of the San Pedro River are confined entirely within the entrenched channel; most were formed after 1937." (p. 19 of exhibit 190)

A view of the diagrams and photographs of the reports supports the positions of Ford, Page, Gookin and Erb that the "post-1880 entrenchment" of this river is simply the latest subset of a depositional process which began after the "Ice Age" and continued to date. It provides the most recent layer added to what is generally called the "Holocene" alluvium. Of all the photographs of importance in the Hereford Report, figure 11, page 12 clearly show that a deposition of flood-bank alluvium which, according to Hereford, is as recent as 1955. It is not as highly permeable or clay free as witnesses for the groundwater users urged in attempting to contrast the same with the general Holocene alluvium unit in which this latest deposition layer is inset. In a bank of no more than 6 or 7 feet there are six layers of clay showing recurring periods of deposition. Moreover, other photographs which are designated as figures 3, 4, 11 and 12 (exhibit 190) show a high degree of comparability

between units of pre- and post-entrenchment depositions. Copies of these photographs follow.

[Picture Omitted]

Figure 11. Photograph of cutbank exposure of older floodplain alluvium (unit f_1) on west side of river 1 km south of Lewis Springs. Downstream to right. Thin dark layers are silty clay. Scale divisions = 10 cm.

[Explanation Omitted]

Exhibit 190 pages 8 and 12.

[Picture Omitted]

Figure 12. Photograph showing cutbank exposure of younger floodplain (unit f_2) alluvium with truck tire 0.6 km south-southwest of Contention. Scale divisions = 20 cm.

Exhibit 190 page 12.

[Picture Omitted]

Figure 4. Photograph showing the geomorphic and cut-and-fill stratigraphic relation of the post- and pre-entrenchment alluvium on the east side of the river 3.2 km north of the Charleston gaging station. Postentrenchment alluvium (unit t_1) forms the lower surface on the left side of the photograph. Upper surface is the pre-entrenchment McCool Ranch alluvium (unit t_m) overlain by Teviston alluvium. Note truncation of beds in the older unit. Map units discussed in text. Scale divisions = 20 cm.

[Explanation Omitted]

Figure 2. Geologic cross section showing correlation of surficial deposits and geomorphology of the inner valley of the San Pedro River in the vicinity of Lewis Springs. The geologic relations, geomorphology, and deposits are typical of the study area.

Exhibit 190 pages 6 and 8.

Upper San Pedro River, Arizona

[Picture Omitted]

Figure 3. Photograph of a typical exposure of the pre-entrenchment alluvium 4.9 km north of Hereford. Upper Holocene Teviston alluvium overlying the McCool Ranch alluvium of Haynes (1987). Note the dark bed of cienega-type deposits near top of scale. Subhorizontal line shows contact between the alluviums. Scale divisions = 20 cm.

Exhibit 190 page 7.

HYDROLOGIC PRINCIPLES

Hydrology is the study of the properties of water. It is a multi-disciplined science encompassing the study of physics, chemistry, geology, geography and climatology. Like many sciences, it depends upon the acceptance of certain principles agreed upon by most hydrologists. To understand the evidence received one should understand the hydrologic principles to which all the witnesses agreed.

ADWR's Report of December 15, 1993 (pages 4 to 19, exhibit 10) states them as follows:

Hydrologic Overview

"The alluvial basins of the arid West are integrated hydrologic systems composed of surface water and groundwater components. Water in these systems flows from areas of high elevation to areas of lower elevation along a path of greatest slope under the influence of gravity. Major perennial or intermitten streams occur in the central portion of the alluvial basin, occupying the lowest areas of the basin floor, flowing along the slope of the basin. The perennial or intermittent stream is typically surrounded by younger alluvium. Surface flow in the stream is derived from runoff from precipitation and groundwater discharge. Groundwater flows in unconsolidated and consolidated margins of the basin toward the center, occupied by the younger alluvium and the stream. Upon nearing the center of the basin in the vicinity of the younger alluvium, groundwater flows under the influence of the basin slope, in the same direction as the stream.

The physical character of groundwater and surface water in the vicinity of the younger alluvium is often identical. Surface water and groundwater in the area occupy the same geologic space and flow in the same direction along the slope of the basin. There is free interaction between groundwater and surface water; groundwater in the younger alluvium contributes to the surface flow and the surface flow recharges the younger alluvium. Distinguishing between groundwater and surface water in the vicinity of the younger alluvium in hydrologic terms to derive a legal standard is problematic

and a byproduct of Arizona's bifurcated legal system." (pages 4-5)

Stream Types

"Surface water streams fall into one of three types: perennial, intermittent, or ephemeral. The type of stream is indicative of the extent of groundwater/surface water interactions taking place." (page 6)

"Perennial streams discharge water continuously through the year. Their source of supply is normally comprised of both direct runoff from precipitation events or snow melt, and baseflow derived from the discharge of groundwater into the stream." (page 6)

"Intermittent streams discharge water for long periods of time, but seasonally. For example, an intermittent stream may flow all winter, every winter, but never flow continuously during the summer. During seasons when baseflow is maintained, groundwater is contributing to the stream. During seasons of discontinuous streamflow, natural and cultural losses may be greater than the contribution from groundwater, resulting in a losing stream. Or, the amount of groundwater discharge itself may have decreased due to natural or cultural uses." (page 6)

"Ephemeral streams discharge water only in response to precipitation events or snowmelt, and do not have a baseflow component at any time of the year; they flow out sporadically. The groundwater system and surface water system do not establish a hydraulic connection in these systems." (page 9)

Aquifer Types

"Aquifers are saturated geologic units that can transmit significant quantities of water under ordinary hydraulic gradients. . . . There are three types of aquifers identified in this study: younger alluvium, tributary aquifers, and nontributary aquifers. While these aquifers are distinct hydrogeologic units, they are interrelated parts of the dynamic groundwater system." (page 10)

Younger Alluvium

"In the Gila River system, younger alluvium aquifers are unconsolidated sand and gravel deposited within the channel course of perennial or intermitten streams by the stream itself. . . . Groundwater in the younger alluvium is derived in large part directly from the stream system. The hydraulic gradients and groundwater flow directions are similar to the associated surface water stream. The groundwater table elevation in the younger alluvium is at or near the surface elevation of the stream.

The younger alluvium is a relatively thin aquifer. In the San Pedro river [sic] watershed, the younger alluvium ranges from approximately 10 to 200 feet thick. Also, the younger alluvium occupies only very narrow portions of the alluvial basins within the Gila River system."

. . . .

"The younger alluvium occurs within, and defines, the channel of perennial and intermittent streams in the Gila River system. It underlies and laterally grounds the associated stream

and is a hydrogeologic feature of the stream. The material that comprises the younger alluvium was deposited by the stream in the recent geologic past." (page 10)

"Conceptually, the stream builds its channel through scouring and fills it by deposition, thus creating the younger alluvium. Throughout geologic time, river systems have complex scouring and depositional histories as a result of the external and internal forces at work within the system. . . . These processes proceed at a geologic pace and are continuing today, defining the younger alluvium." (page 11)

Tributary Aquifers

"Tributary aquifers occur between impermeable mountain fronts and younger alluvium. They receive water from mountain front recharge and infiltration from runoff. The aquifers are in direct hydraulic connection with younger alluvium and transmit water to younger alluvium. The tributary aquifers normally have hydraulic gradients distinct from the hydraulic gradients distinct from the hydraulic gradient of surface water streams and have flow directions toward surface water streams unless altered by well pumping." (page 11)

Nontributary Aquifers

"Nontributary aquifers are located in isolated groundwater basins surrounded almost entirely by impermeable hardrock with relatively narrow connections to other groundwater basins and aquifers. Nontributary aquifers have no hydraulic connection with either the younger

alluvium or tributary aquifers. Any stream overlying a nontributary aquifer is ephemeral." (page 12)

Aquifer Flow Characteristics

"Aquifers are more than just reservoirs of groundwater. They are dynamic systems that receive inflows of groundwater, transmit groundwater and, in some cases, discharge groundwater to surface streams. . . . The inflow of water recharge occurs from the infiltration along mountain fronts and stream channels, and from infiltration of excess water from cultural uses. Aquifers that border high mountains normally receive significant mountain front recharge and recharge from streamflow infiltration. Aquifers that underlie large areas of agricultural irrigation experience significant recharge incidental to the irrigation practices.

Groundwater in transit will eventually discharge to a stream if not first withdrawn by natural (plant life) or cultural uses (pumpage from wells)." (page 12)

"There are four types of groundwater/surface water interactions in the Gila River system: Alluvial valley streams, alluvial valley streams with confined zones, bedrock canyon streams, and mountain front streams." (page 14)

Alluvial Valley Streams

"Alluvial valley streams are perennial or intermittent streams that flow in alluvial basins and are underlain and bounded by younger alluvium. The alluvial basin is a structural trough filled with unconsolidated sediments

derived from the adjacent mountains. These unconsolidated sediments are generally referred to as basin fill deposits (Anderson, and Johnson, 1985). The perennial or intermittent stream commonly occupies a narrow inner valley, composed of younger alluvium, which includes the dynamic channel of the stream.

A generalized cross-section of an alluvial valley stream segment is shown in Figure 2-4a. As depicted in this figure, the younger alluvium and perennial stream occupy the inner valley.

Alluvial Valley Streams

[Picture Omitted]

Figure 2-4a. Generalized cross-section of alluvial valley stream segments.

Page 15 of Exhibit 10.

The overall groundwater system within alluvial valley stream segments has two broad components: groundwater flowing toward the stream system, and groundwater flowing with the stream system. The groundwater flowing toward the stream occurs in the tributary aquifer. Groundwater in the younger alluvium generally flows in the same direction as the stream but, to a lesser degree, also from the adjacent tributary aquifer." (pages 14-16)

Alluvial Valley Streams With Confined Zones

"Alluvial valley stream systems sometimes contain tributary aquifers with underlying confined zones. The confining layers in the tributary aquifer are composed of impermeable silt and clay (Anderson, and Johnson, 1985). The

confining layers prevent vertical movement of water from the underlying tributary aquifer to the overlying younger alluvium in particular locations (Figure 2-4b), thus interrupting direct hydraulic connection between the two aquifers. It must be noted, however, that these situations occur only occasionally; whether a particular well withdraws water only from a confined zone should be determined on a well by well basis." (page 16)

Alluival Valley Streams with Confined Zones

[Picture Omitted]

Figure 2-4b. Generalized cross-section of alluvial valley streams with confined zones

Page 17 of Exhibit 10.

Bedrock Canyon Streams

"Bedrock canyon streams are perennial or intermittent streams located in canyons bounded by consolidated tributary aquifers or impermeable bedrock." (page 16)

Mountain Front Streams

"Mountain front streams are stream segments in transition from bedrock canyons to alluvial basins. . . . " "The streams are perennial or intermittent and are underlain and bounded by younger alluvium. Many streams make a transition from bedrock canyon streams, with narrow younger alluvium bounded by hard rock, to alluvial valley streams with younger alluvium bounded by tributary aquifers." (page 19)

Three other definitions need to be set out.

Vadose Zone – An unsaturated (dry) zone above the water table (open to atmosphere) where water pressure is less than the atmospheric pressure.

Permeability – The rate of hydraulic conductivity of the material the water is passing through (refers to aquifer).

Transmissivity – The rate of hydraulic conductivity multiplied by the height of the geologic unit it is contained in.

WHAT DOES "IN RE GILA" REQUIRE

Unfortunately, the term "subflow," which "In re Gila" deals with, has no scientific meaning in the vocabulary of hydrologists or geologists. It is a term only lawyers and judges use. Every witness said that. All we can do is apply their scientific principles to find a reasonable factual basis in which to enwrap the legal concept of "subflow." To do that we must review the language of "In re Gila."

On page 388 of 175 Ariz., the Court quoted with approval the following from "Southwest Cotton":

> "there cannot be any abstraction of the water of the underflow without abstracting a corresponding amount from the surface stream, for the reason that the water from the surface stream must necessarily fill the loose, porous material of its bed to the point of complete saturation before there can be any surface flow."

. . .

> "The test is always the same: Does drawing off the subsurface water tend to diminish appreciably and directly the flow of the surface stream? If it does, it is subflow."

On page 391 it says of "Southwest Cotton":

> "It seems clear that the court considered subflow and tributary groundwater to be two different classes of underground water. The former is subject to appropriation under the predecessor of A.R.S. § 45-141(A); the latter is not."

On page 390 the present court quotes Kinney's 1912 work on "The Law of Irrigation and Water Rights" that "subflow" is "strictly confined to the river bottom" and "the water must be within the bed of the surface stream itself." Yet on page 391 of 175 Ariz., the case states an opinion more in conformity with present science and at odds with Kinney's narrow-bed theory:

> "We believe the *Southwest Cotton* court drew a line between subflow as part of the stream and water in the surrounding alluvium that is either discharging into the stream or being discharged by the stream. That line is relatively close to the stream bed, with variations depending on the volume of stream flow and other variables. Thus, if a well is drawing water from the bed of a stream, or from the area immediately adjacent to a stream, and that water is more closely related to the stream than to the surrounding alluvium, as determined by appropriate criteria, the well is directly depleting the stream. If the extent of depletion is measurable, it is appreciable. This is not an all-or-nothing proposition. For example, if the cone of depression of a well has expanded to the point that it intercepts a

> stream bed, it almost certainly will be pumping subflow. At the same time, however, it may be drawing water from the surrounding alluvium. Thus, part of its production may be appropriable subflow and part of it may not. Even though only a part of its production is appropriable water, that well should be included in the general adjudication."

Moreover, the present court said on page 391,

> "To say that all of an alluvial valley's wells may be pumping subflow is at odds with *Southwest Cotton's* statement that subflow is found within or immediately adjacent to the stream bed."

The sentence quoted is dependent upon the previous sentence which states,

> "The record shows, however, that in a given area the younger alluvium may stretch from ridge line to ridge line so that all wells in the valley would be in or near the younger alluvium."

As stated before, every witness found that statement not scientifically supportable. It violates general principles of geology and hydrology. Therefore, this trial court must suggest, based on the evidence before it, that at least some portion of the wells in a valley's alluvium must be pumping "subflow" or their "cones of depression" have reached the "subflow" area. Therefore, they are depleting the surface flow as indicated by the previous quotation on pages 32 and 33 which discusses the surface flow's tendency to fill the loose, porous material of its bed. The only logical and rational way the "Southwest Cotton" and "In re Gila" theories as to "subflow"

can be made consistent with the scientific principles testified to is to turn to the tests on page 392 of 175 Ariz. where the Supreme Court itself urged of *flow direction, elevation, gradient* and *chemcial composition.*

> "Whether a well is pumping subflow does not turn on whether it depletes a stream by some particular amount in a given period of time. As we stated above, it turns on whether the well is pumping water that is more closely associated with the stream than with the surrounding alluvium. For example, comparison of such characteristics as elevation, gradient, and perhaps chemical makeup can be made. Flow direction can be an indicator. If the water flows in the same general direction as the stream, it is more likely related to the stream. On the other hand, if it flows toward or away from the stream, it likely is related to the surrounding alluvium."

If we add to those tests the concept that if a "subflow" zone can be differentiated from adjacent geologic units such as tributary aquifers and the basin-fill aquifer which discharge into it or receive discharge from it, a set of principles can be developed to define "subflow" and still be consistent with "Southwest Cotton" and science.

DEFINING "SUBFLOW"

A. General Principles

The briefs filed, except for that of the Nature Conservancy, take a position of 1) a narrow band defined by the edge of the river principal channel, or 2) a slightly larger post-1880 depositional layer, or 3) the edge of the central valley's younger alluvium. The Nature Conservancy

offers two solutions, the first geologic and the second solution provided by the area's natural vegetation, the growth of phreatophytic plants located in the riparian zone. Consideration of all of these proposals does not require an "either/or" solution. Rather, it provides an opportunity to use a building-block method to find proper parameters of the "subflow" zone laterally and vertically. This Court will attempt to do this by going from the narrowest to the widest zone, and for each asking whether it can be a part of a wider zone or does it define the absolute limits of "subflow."

Before discussing the conflict between different sides or proposals, the Court finds that the opinion of "In re Gila" and the evidence which was uncontested requires that any "subflow" zone must be defined by at least the following principles:

1. The "subflow" zone must be adjacent and beneath a perennial or intermittent stream.

2. It may not be adjacent or beneath an ephemeral stream. However, it may be adjacent or beneath an ephemeral section of a perennial or intermittent stream, if the ephemeral section is caused by adjacent surface water diversion or groundwater pumping. There must, however, be a saturated zone beneath connected to similar zones beneath the upper and lower perennial or intermittent stream sections.

3. Except as set forth in paragraph 2 above, there must be a hydraulic connection between the surface stream and the "subflow" zone.

4. The "subflow" zone must be distinguished from adjacent tributary aquifers or connecting basin fill.

5. The parameters of the "subflow" zone, if it is to be defined by reference to the saturated floodplain alluvium, Holocene alluvium, or younger alluvium, must be outside of and not include those tributary alluvial deposits known as "inliers" as indicated in figure 6 of tne Stetson Report (exhibit 2).

6. Wells which are located in but perforated below the saturated floodplain alluvium aquifer are to be included in the "subflow" component unless these perforations are proven by their owners to be below a confining zone of impermeable material such as clay as the inevitable "draw-down" of the well must affect the "subflow zone" above the perforation.

7. Wells located outside the lateral parameters of the defined "subflow" zone are not included unless it is proven that their "cones of depression" reach the "subflow" zone and the drawdown from the well affects the volume of surface and "subflow" in such an appreciable amount that it is capable of measurement.

B. Edge of the Principal or Dynamic Channel

The reports of Don Young for the State and William G. Wellendorf for the Town of Mammoth and the Gila Valley Irrigation District (exhibits 5 and 8) propose the narrowest of the "subflow" zones, to wit: the edge of the bed of the principal channel which, interestingly enough, Mr. Wellendorf defines as the "Holocene" channel as

contrasted to Dr. Montgomery's "post-1880 entrenchment." Within its banks the low-flow stream meanders back and forth in large figure "S" curves. These banks are defined by the highest flows of one- to three-year flood cycles.

The sole merit of these proposals is the banks or edges of the channel are easily found on aerial photography: "just look for the white sand." He frankly admitted on June 1, 1994 that all he did was use the contour lines on the U.S.G.S. quad maps for the basin and little else. These contour lines bear no relationship to any geologic difference in the formation. Wellendorf's testimony clearly showed a theory of using the most easily found ground feature and then dealing with the real problems of surface water depletion on a case-by-case method by determining the extent of each well's "cone of depression." The problem with any proposal which emphasizes "cone of depression" solutions over finding an adequate "subflow" zone is that the determination of a well's "cone of depression" is a very complicated, difficult and expensive process. This is seen in the confrontational testimony of Montgomery, Ford and Page on how to use the various computer-program techniques and which program is more accurate or useful. All, however, agreed that "cone of depression" analysis is expensive and complicated, and that the assumptions necessary and the frequent lack of data to support such computer techniques reduce the reliability significantly.

Even witness Wellendorf agrees as is seen in this discussion between himself and the Court as reported on pages 64 and 65 of Volume VIII of the hearing transcript:

"THE COURT: Did you not make this statement on page 6 of your report, the last sentence of the middle paragraph: 'While empirical techniques exist to numerically model this technique, heterogeneities known to exist in aquifers quickly reduce the effectiveness of these techniques.'

I probably mispronounced 'heterogeneities.' Is that correct?

THE WITNESS: Yes.

THE COURT: What in fact you're basically telling us is that the technique of determining cones of depression, particularly when the elevation of the water level is not flat all the way across but is sloping down to the river and maybe [sic] sloping the other way naturally, is subject to a number of assumptions that make it very difficult.

THE WITNESS: Correct.

THE COURT: So from your standpoint of what you've done, you've given us the narrowest subflow zone and set up the most complex method of determining what we're going to set up in this adjudication, because you are going to have to determine individually whether or not each well has a cone of depression which hits either your subflow zone or the stream flow, isn't that correct?

THE WITNESS: Yes."

Also, witnesses agreed no one with any common sense locates a well in the channel where the flooding expected on a one- to three-year basis can destroy the well's mechanical and electrical functions. Therefore, to

utilize a method which would put every single well in the basin outside the "subflow" zone – even where a well sits on the banks of the river 10 to 20 feet from its flow – presents a danger of turning this adjudication into a totally meaningless activity while the river is slowly sucked dry like the Santa Cruz River.

While Mr. Young suggest the vertical limits of his "subflow" zone are the top of the older alluvium or bedrock where no older alluvium exists, Wellendorf's vertical limit is almost impossible to find especially if one looks at his figure 2 exhibit of "Holocene Cross Channel Cross Section and Complete Fining Upward Sequence" (see exhibit 8). He appears to place his vertical bottom at bedrock. The testimony of this hearing indicated deep alluvial and basin-fill deposition. There was no testimony of how far it is to bedrock. The only limit is the HSR use of a 1,200 foot fill to determine the aquifer capacity of 85 million acre feet. The question then must be asked, "Why not the same basis for choosing the lateral limits as those used to choose the vertical limits?" When we note that what these two experts had done was draw a hypothetical line down the middle of the same geological unit, we must realize that their lateral limits have no geological, hydrological or riparian basis.

If that weren't enough, the real problem of this proposal is that the location of today's principal channel boundaries have no stability all as admitted by Mr. Wellendorf on page 78, line 8 to 23:

> "THE COURT: Let me ask you two other questions because of what she brought up. Dr. Montgomery suggested that the principal channel, while probably somewhat stabilized today,

has previously had and does still have some meander effect as compared to his theory of post-entrenchment alluvium. Would you agree with that?

THE WITNESS: Yes.

THE COURT: So that the channel is subject to being moved by high floods, high flows and things of that nature.

THE WITNESS: Yes, I think it would take a pretty major event.

THE COURT: Like some of the floods that are mentioned in Hereford's report?

THE WITNESS: Yes."

At the Paul Sale property near Winkelman on March 4, 1994, Mr. Sale explained how the 1983 flood had moved the channel 1,000 feet westward and wiped out 90 acres of his farm land. In 1993 the channel moved once more. This time it ended up 500 feet eastward after it moved westward again and took out 15 additional acres of his pecan orchard. Further, he also pointed out the several locations the principal channel had occupied since he had begun farming there in 1970 and how it had moved after the 1979, 1980, 1983 and 1993 floods.

On the last day of court testimony Steve Erb testified how a comparison of the 1935 aerial photograph to the more recent 1990 aerial photograph showed significant changes in location of the river channel from Pomerene north for several miles (see exhibits 260 and 261). During his cross-examination there was a discussion of an overall review of the 1935 aerial photography and a comparison to the latest 1990 photographs. This was also reviewed in

a discussion on our field trip at the beginning of March 4, 1994.

Also in the Hereford report (exhibit 190), page 8, figure 5, there is presented a clear representation of channel migration in a large meander about 2 miles north of the Hereford bridge. It illustrates channel movement of approximately 1,500 feet.

As a result of this, the Court requested that ADWR compares its 1935 aerial photography with its latest 1990 photos along the entire river and report any channel changes found. That report now completed indicates the channel is not stable. It often narrows and shifts significantly. The results of that study, exhibit 365 and Appendix E1 to E3 and the map of the area of the study (Appendix D) are attached. The study shows a single channel widening of up to 168 feet and a narrowing in 27 locations of from 67 feet to 976 feet. It also shows 28 shifts in overall channel location of from 66 feet to 1,200 feet.

Unfortunately none of the 1935 aerial photography was then placed in evidence during the ten-day hearing. The same was true of most of the 1990 aerial photography except for exhibits 260 and 261. This Court, therefore, brought the matter up at its monthly hearing on April 29, 1994 in the following manner as indicated by its minute entry of that date.

> "The Court, while working on the ruling for the trial, recalled the testimony of Steve Erb and the discussion with Mr. Sales [sic] regarding the movement of the river at Pomerene during the 1970, 1983 and 1993 floods. The Court requested that ADWR compare the 1935 and 1990 aerial photographs to determine the movement of the

> channel as well as what happened to the riparian areas along the river. The photos from 1935 are the earliest photos except for some old historical photos found in exhibit 190, the Hereford Report, and the book entitled The Changing Mile. ADWR did 26 transects on the river and found a substantial narrowing of the channel. The widest widening of the channel from 1935 to 1990 was 100 feet; the greatest narrowing was 900 feet. There was only one instance of widening but 25 instances of narrowing and 26 instances of substantial shifts, the largest of which was approximately 1,000 feet. The photographs will be available after the hearing and Chuck Cullom will answer questions from counsel. ADWR will have the materials available for the next 10 days and copies are available. The Court intends to use these studies for its ruling. If counsel wish to contest the results of this study, affidavits may be filed as was done with the rebuttal affidavits at the evidentiary hearing."

Thereafter several parties filed affidavits. Salt River Project filed an Affidavit of Jon Ford who supports the conclusions of ADWR and opines what appears to be a rational reason for the narrowing of the channel to wit: vegetative growth during periods of low water flow, consisting of phreatophytes above the "subflow" zone, attempts to fill in all but the low-flow channel. However, during periods of high flow the erosive force of the floods "clean out" these vegetative obstructions. William G. Wellendorf also filed an Affidavit which basically criticized ADWR's technique of photo interpretation.

Dr. Errol Montgomery also filed an Affidavit which also attempts to critique ADWR's photo comparison method, but basically agrees with ADWR's substantial conclusions that there is substantive evidence of a narrowing of the principal channel from 1935 to 1990 and some shifting of its location. Basically Dr. Montgomery's Affidavit was directed to showing that most, if not all, of these shifts in location and size took place within the boundaries of what he proposes for the "post-1880 entrenchment" and deposition zone.

As the affidavits increased, there was a further request for an evidentiary hearing and the Court agreed to hold such and did on June 14 and 15, 1994.

The hearing produced testimony from Charles Cullom of ADWR who did all of its reports on the comparative aerial photo interpretation, Jon Ford for SRP, William Wellendorf for the Town of Mammoth and Drs. Schumm and Montgomery for the groundwater users.

While all agreed that an attempt to compare early aerial photography (1935) to recent photography (1990) was a difficult scientific process which could not produce exact comparisons, all agreed that experienced analysts could determine important information if carefully done. This Court believes all who testified were very experienced, did a careful job and the results were very important in that it showed:

1. The principal channel in nearly every instance where a comparison could be made was narrowed often significantly between 1935 and 1990.

2. When that narrowing occurred, there was often a shift in location of the whole channel to the east or west. In several instances this shift took it beyond the channel parameters of either Wellendorf, Young, Schumm or Montgomery. See exhibits 260, 261, 313, 317, 319, 320,324, 325, 328, 330, 331, 332, 333, 334, 335, 338, 339 and 365.

Exhibits 313 and 365 are the latest ADWR calculations of the channel changes on the 28 transects mentioned previously. Exhibit 331 is the calculation made by Errol L. Montgomery and Associates, Inc. from the same aerial photography. The latter two exhibits (365 and 331) are also attached as Appendix E-4 and E-8. In addition to those calculations, this Court made its own comparison of each of the aerial photographs and based on all of the above finds:

CHANNEL MOVEMENT				
TRANSECT LOCATION	CHANNEL SIZE	FEET	DIRECTION OF MOVEMENT	FEET
1a	widen	168'	east	500'
2a	narrowed	207'	west	491'
2b	narrowed	307'	east	656'
2c	narrowed	477'	east	288'
2d	narrowed	104'	east	143'
3a	narrowed	170'	east	449'
3b	narrowed	439'	west	429'
3c	narrowed	398'	east	530'
3d	narrowed	134'	east	107'
4a	narrowed	236'	east	190'
4b	narrowed	337'	west	557'
5a	narrowed	100'	west	64'
5b	narrowed	630'	west	541'
5c	narrowed	62'	east	964'
6a	narrowed	134'	west	234'
6b	narrowed	100'	west	1200'
6c	narrowed	0'	west	667'
6d	narrowed	300'	east	466'
7a	narrowed	367'	west	700'
7b	narrowed	200'	east	500'
7c	narrowed	100'	east	100'
7d	narrowed	133'	east	133'
8a	narrowed	966'	west	900'
8b	narrowed	400'	east	366'
8c	narrowed	200'	east	233'
9a	narrowed	500'	east	433'
9b	narrowed	800'	east	500'
9c	narrowed	399'	east	566'

In spite of all of the protestations of Mr. Wellendorf and Dr. Montgomery that, in their opinions, the channel from 1935 to 1990 was "stable," any view of the channel location as shown on these two sets of aerial photographs taken fifty-five years apart shows the invalidity of those opinions.

While the Court clearly finds that the Wellendorf and Young proposal of the principal channel as the extent of the "subflow" zone is without merit, the Court does find that the parameter of that channel does constitute the innermost portion of that zone.

C. "Post-1880 Entrenchment" and Deposition

The principal theory proposed by the "groundwater users" and its supporters is the theory of Drs. Montgomery and Schumm that "subflow" is best defined by use of the lateral limits of what they claim is the post-1880 depositional layer and the vertical limit is the bottom of the Holocene or the top of the basin fill. Unfortunately, neither of their reports filed on December 14, 1993 (exhibits 6 or 7) mentioned this theory. Dr. Montgomery proposed basically the same lateral limits as Dr. Wellendorf and Mr. Young – a smoothed principal channel – and Dr. Schumm proposed nothing as 17 of the 19 pages of his expert report were taken up with his "curriculum vitae." Only two court days before trial, the new theory was revealed in a "Disclosure Statement" which presenters of witnesses including the groundwater users did not have to file. In spite of its late disclosure, the Court permitted the theory to be presented and it still thinks it appropriate because the entrenchment and deposition theory is

supported by the work of Richard Hereford (exhibit 190). However, the Hereford Report only discusses a portion of the upper San Pedro basin. There is no mention of the lower basin from Pomerene north. His work probably related to the part of the basin he knew best. A copy of the map of the area in which he worked is attached as Appendix G.

The lower basin is quite different physically and geographically. This was quite evident form the field trip. The lower river valley is much narrower. The gradient of the stream is steeper. There are more areas of thicker vegetation. The mountains and adjacent foothills encroach closer to the river. The Court has attached seven oblique aerial photographs as Appendix H, I, J, K, L, M, and N. The first three are typical views of the upper basin and the last four are typical of the lower basin. The differences between the basins are quite evident in comparing the different sets. With regard to the lower basin, the last four photographs present a fairly clear view of where the basin fill meets the floodplain alluvium and how the riparian vegetation can be used to define the "subflow" zone in some areas.

This Court will not comment on the charges of lack of credibility that the opponents of the groundwater users seem to dwell on because of their late disclosure. This Court assumes that Drs. Montgomery and Schumm became aware of the Hereford Report after their initial investigation and decided that the geologic unit which that report presented made a lot more sense than the edges of a stream channel. This was probably for the same reasons this Court pointed out previously. It was

also easier to defend; and one can hardly fault them for that.

Having said that, the Court believes the lack of channel stability discussion previously set forth on pages 39 to 43 of this Order applies equally to Montgomery and Schumm's theory as to Wellendorf and Young's theory of the edge of the principal channel. The "post-1880 entrenchment" and deposition theory is entirely dependent on the deeper entrenchment of the channel after 1880. If that channel lacks stability, it is difficult to understand how the deposition, which takes place after such flooding entrenchment, can have any more stability than the channel it follows. Moreover, if as Hereford suggests, most depositional layers occurred after 1937 while the entrenchment started 50 to 57 years earlier, that geologic unit's lateral stability must be considerably less than that of the Holocene which started after the "Ice Age" and has been in place 10,000 or more years. A post-1937 depositional era, at best, is a minuscule portion of geologic time.

When cross-examined about the lack of channel stability as discussed previously on pages 39 to 43, Dr. Montgomery's position was that such stability problems related only to the physical channel itself and since he relied on the parameters of the "post-1880 entrenchment," the problem did not affect the validity of his opinion. However, after viewing the 1969 infrared aerial photograph of the area north of Benson and past Pomerene, his exhibits 340 and 341, he had to agree that the 1935 channel was significantly different and much of it outside of his defined "post-entrenchment" boundaries from the Benson railroad bridge north to Pomerene and in the Cascabel area.

Much as Drs. Montgomery and Schumm might desire the Court to accept these variations from where they first located this "post-1880 entrenchment" corridor, there are other facts which further erode their "stability" claim for this post-1880 entrenchment" theory which are as follows:

1. The location of the original dam for the Pomerene Canal was located in Township 17S, Range 20-21E, section 25. It is obvious that the original dam had to be located in the channel of the river as it was the source of the community of Pomerene's irrigation water at that time. However, when the 1921 flood destroyed and moved that dam downstream, it was replaced with a newer dam in section 36 to the southwest. Yet, the Montgomery designation of the "post-1880 entrenchment" defines a different channel and fails to recognize the old channel where the first dam was. (See exhibits 86 and 319.) By measurement it is clear Dr. Montgomery's "post-1880 entrenchment" leaves out at least 4,000 feet of old channel, some of which is 700 to 800 feet east of their designated "post-1880 entrenchment" corridor.

2. Also, in sections 3 and 4 of Township 15S, Range 20E, there is another large area missed in the original designation of exhibit 88. It is now shown on exhibit 320 and was referred to in the testimony of June 14, 1994 as an area of probably an early attempt at an orchard.

3. Another important area of misdesignation is the area of the Paul Sale property, sections 5, 6 and 8 of Township 6S, 12 and 16E. (See exhibit 321 to 325 which are transparencies of the channels boundaries as shown

on the 1935, 1947, 1955 and 1990 and most recent evolution after the 1993 floods.) In comparing these exhibits with exhibit 91, the map on which Dr. Montgomery or his associates drew the parameters of the "post-1880 entrenchment" channel, it is clear they missed by nearly 1,000 feet in some places, the east edge of channel in sections 5, 6 and 8 as shown on the 1935 aerial photography.

Attached as Appendix O-1 to O-5 are exhibits 317, 319, 320, 325 and 338 which indicate the misdesignations of the channel in the areas of the Benson railroad bridge to the north, the dam for the Pomerene Canal, Cascabel and the Paul Sale property.

Also, if one examines the exhibits prepared by Dr. Montgomery's firm which are exhibits 332, 333, 334 and 335, and the enlargements of the first three which are exhibits 347, 348 and 349, it is clear that even he agrees that at transects 2a, 2c, 3b, 3c, 3d, 5a, 5b, 5c, 6b, 6c, 6d, 8a, 8b, 8c, and 9b the 1935 aerial photography shows the channels of the river as located outside of those parameters of what he calls his "post-1880 entrenchment." Copies of exhibits 332 to 335 are attached as Appendix O-6 through O-9.

Another problem with this "post-1880 entrenchment" theory is the lack of consistency between the lateral and vertical limits of the proposed "subflow" zone as discussed previously. Also, it must be pointed out that with a knowledge that this post-1937 depositional layer has a thickness of from 4 to 13 feet and some of it is "vadose" or non-saturated, we have at best a saturated post-1937 layer of from 0 to 10 feet. In most of the river's length it

sits above or is inset in the Holocene layer. Therefore, the Holocene layer below it must be totally saturated for the balance of its 40 to 200 feet of depth. In spite of this, Drs. Montgomery and Schumm as well as Mr. Young propose a vertical limit of "subflow" at the bottom of the Holocene and admit that any well which has perforations below it and in the basin fill will quite quickly draw down water from the Holocene. The water pulled from any "subflow" zone will quickly affect the volume of the surface stream above.

A "subflow" zone defined by this post-1937 depositional layer theory has very few wells located within its lateral limits. This, of course, increases the number of the "cone of depression" analyses which must be made. The problems associated with this analysis have been previously discussed.

At the end of the first 10 days of hearings, Drs. Montgomery and Schumm finally hung their hats on two principal claims:

1. The post-1880 or post-1937 depositional layers are significantly more permeable than the Holocene; and,

2. The Holocene is cemented in a way that bonds the sand, gravel and boulders into a consolidated mass through which less water can pass.

However, the testimony of Dr. Maddock, Steve Erb, Jon Ford, Oliver Page and Allan Gookin are all in direct conflict with those claims. Further, the drill logs of the recent drilling by Ford and Page disprove this theory as did ADWR's interpretation of the ADOT drill logs on the bridges on I-10 at Benson and the Charleston and Lewis

Springs bridges. This is also true of other well logs in the area including the well logs of the Magma wells at site number 11 on our field trip 5 miles south of Mammoth (see the rebuttal affidavits of Ford and Page, exhibits B, C and D attached to the Salt River Project Post-Hearing Brief of March 18, 1994 and exhibits 262, 271, and 281 from the trial).

Probably the most confrontational of all the field trip discussions between Drs. Montgomery and Schumm and Jon Ford and Oliver Page occurred on the afternoon of March 4, 1994 at site 11. It was at the southwest corner of the cultivated field and in the river bed adjacent thereto shown on exhibit 78 in evidence and attached as Appendix M. Here Drs. Montgomery and Schumm tried to explain why the field just east of the river and the wells located adjacent thereto were not in the "subflow" zone. This was, they claimed, because the "post-1880 entrenchment" deposits which were only in the sandy areas adjacent to the river, were more permeable and less cemented than the Holocene alluvium which underlay the cultivated fields and large phreatophytic areas of mesquite out of which those fields extracted. A look at the photograph (Appendix M) shows the physical relationships. To the knowledgeable eye it probably shows the edge of the "subflow" zone where the phreatophytes meet the basin fill rather than simply the sandy banks of the river as claimed by Drs. Montgomery and Schumm. Further, in spite of all their claims of new kinds of tests as to permeability and cementational differences between the post-1937 depositional layer and the Holocene it was inset into, three Magma wells drilled in 1991 in this very area and shown in ADWR well log registration records

reveal the true underground record when they showed the following:

Well #1, registration #55-529969, drilled 2/26/91
sand, gravel and cobbles from 0 to 45 feet
clay from 45 to 47 feet
sand gravel and cobbles from 47 to 63 feet

Well #2, registration #55-529971, drilled 2/26/91
sand, gravel and clay from 0-32 feet
sand, gravel and cobbles from 32-65 feet

Well #3, registration #55-530124, drilled 1/28/91 to 2/8/91, to 1000 feet of depth
sand and gravel from 0-70 feet

This last well was drilled by Dr. Montgomery's firm. (See the attachments to the Salt River Project Post-Hearing Brief all of which are copies of drill log records filed with ADWR as required by statute.

Obviously, Magma's own well-drilling logs do not support the Montgomery/Schumm theory of higher permeability and less cementation of this post-1937 depositional layer.

In the opinion of the Court, the weight of the evidence clearly fails to indicate any significant difference in permeability between what Drs. Montgomery and Schumm contend is a "post-1880 entrenchment" depositional layer and the balance of the Holocene floodplain alluvium of which it is a part. The Court finds the testimony of Messrs. Erb, Ford, Page and Gookin have the greater weight and the exhibits presented showed no indication of any claimed differences.

It is incongruous for the groundwater users to first claim that there is a great disparity between the lithology,

hydraulic conductivity, and other characteristics of the post-entrenchment alluvium and the Holocene, and then advocate that the post-entrenchment alluvium be used only to define the lateral limits of "subflow" with the Holocene to be utilized to set its vertical extent. This is particularly true when the entrenchment is only 5% to 10% of the Holocene depth.

Even Dr. Montgomery's own Report on October 2, 1987 (exhibit 11 of the 1987 hearings) describes the floodplain alluvium of the San Pedro in the following terms:

"FLOODPLAIN ALLUVIUM

Geologic Feature

> Floodplain alluvium occurs along the San Pedro river and its major tributaries. . . . Records of water wells which penetrate the unit near San Manuel indicate that the thickness of the floodplain alluvial deposits ranges from about 30 to 205 feet. The floodplain alluvium is commonly coarse-grained and consists *chiefly of non-consolidated sand, gravel, and boulders.* (emphasis added)

Groundwater Features

> In the Lower San Pedro Basin, the groundwater level commonly occurs above the base of the floodplain alluvial deposits, and the lower parts of the unit are saturated. the deposits are highly permeable, comprise efficient infiltration media, and yield large amounts of groundwater to wells that are completed in the unit. *Because the deposits are commonly coarse-grained and on-consolidated, the floodplain alluvial deposits are usually the most permeable of the hydrogeologic units in the basin.* The floodplain alluvium accepts and

> transmits recharge water from stream flow. Groundwater in the unit generally occurs under confined conditions." (emphasis added)

There is no mention therein of any "post-1880 entrenchment" or depositional unit, its high degree of permeability or lack of cementation.

This Court finds the groundwater users theory of limitation of the parameters of the "subflow" zone to be without merit. However, like the principal-challenge boundary theory out of which it evolved, the Court believes the lateral bounds of this theoretical unit are within the parameters of a broader "subflow" zone wider than these groundwater users propose.

D. The Nature Conservancy Riparian Zone

The position of the Nature Conservancy is urged by an attorney and hydrologist whose efforts were *pro bono*. It is a pleasure to have such people involved and to be able to largely agree with their position. Their proposed alternatives were:

> "It is clear from all of the evidence that the only reasonably acceptable geologic unit by which subflow may be defined is the holocene alluvium by whatever norm referred to." (p. 2)

Alternatively they submitted:

> " . . . it is not necessary to resolve the geologic debate in order to define the subflow zone. Fortunately, nature has already provided readily observable surface indicators of where this underground water is located, those being the

phreatophytic plants located in the riparian area or zone immediately adjacent to the river." (p. 5)

If we were limited to only physical evidence of water use at a particular location which had an observable effect on the height of the flow in the stream itself, only the testimony about phreatophytes would meet that test. During our field trip there were anecdotal accounts by Messrs. Lomeli and Smallhouse and Ms. Clark about observable water use by phreatophytes that had a direct, immediate and measurable impact on the surface flow of the adjacent stream. These impacts occurred on a daily or diurnal basis and changes in stream flow were readily observable as were seasonal variations, all relating to the metabolic functions of the plants. The testimony was that the fall and winter seasonal changes could double the stream flow because the leaves were off the trees and there was no transpiration occurring. While daily changes between daylight and dark were not as great, they were clearly discernible. Even Dr. Montgomery agreed when cross-examined by Steven Weatherspoon about a camping experience where the flow was non-existent when he and his son went to sleep, but the stream flowed in the morning because the stream recharged itself at night when the phreatophytes' pumping mechanism was not in effect. No one can be surprised by such facts when the water balance of the San Pedro previously discussed showed that of its total produced supply of 158,610 acre feet, approximately 1/8 or 52,600 acre feet went into phreatophytic use.

The evidence is undisputed that riparian plants directly draw off and diminish the surface flow of adjacent streams. Riparian forestation meets the test of "In re

Gila" which asks, "Does the drawing off the surface water tend to diminish appreciably and directly the flow of the surface stream" (p. 393 of 179 Ariz.) Moreover, this Court accepts that we have a readily usable definition of "Riparian Area" in A.R.S. § 45-101(b):

> " 'Riparian area' means a geographically delineated area with distinct resource values, that is characterized by deep-rooted plant species that depend on having roots in the water table or its capillary zone and that occurs within or adjacent to a natural perennial or intermittent stream channel or within or adjacent to a lake, pond or marsh bed maintained primarily by natural water sources. Riparian area does not include areas in or adjacent to ephemeral stream channels, artificially created stockponds, man-made storage reservoirs constructed primarily for conservation or regulatory storage, municipal and industrial ponds or man-made water transportation, distribution, off-stream storage and collections systems."

Unfortunately, this Court does not believe that delineation of all riparian areas in their predevelopment stage, as advocated by the Nature Conservancy, will be as easy as it thinks. A look at the 1935 aerial photography of the area does not easily show the boundaries of riparian area in a predevelopment stage. Even then there were large areas of agricultural field development, particularly in the St. David and Pomerene areas. The same is also true in the lower basin where Jack Smallhouse told us his family once farmed 2,000 acres along the river. The field trip in the Hereford and Palominas areas shows fields long cultivated but now unused with limited phreatophyte invasion. Another problem is that in the true

predevelopment age before the significant overgrazing of the late 1800s and early 1900s, the heavy grass cover of the upper basin prevented much phreatophication. (See exhibit 190, page 15.) The other side of the coin is that as cultivated fields along the river went out of production, phreatophication increased. (See figures 16 to 19 of exhibit 190.) This is clearly shown by the pictures of the Palominas Bridge taken in 1939 and 1991 which were attached. This shows the problem of phreatophication increases, resultant channel narrowing and later highly erosive effects of flooding when high flows are forced through narrower and narrower channels all as described in the Affidavits of Ford and Wellendorf.

In addition to the study of channel changes and shifts, this Court also requested ADWR to also analyze any change in riparian habitat along the San Pedro River from 1935 to 1990. The study indicated significant riparian changes from reductions of "up to 3,100 feet along one transect to an additional 1,900 feet along another transect." (A copy of that analysis, also a part of exhibit 365, is attached as Appendix F-1, F-2 and F-3.) A study of the 1990 aerial photography shows nearly all reductions to be the result of cultural development such as new agricultural fields.

Figure 5, page 8 of exhibit 190, which is reproduced in Oliver Page's Report for Stetson Engineering in exhibit 2 as its figure 7, and is attached here as Appendix P, shows the lateral migration of this river from 1890 to date in a large meander about 2 miles north of Hereford. Based on our March 4, 1994 field trip, that area is one of many old and new channels. There is nearly a mile of phreatophytic width in this area.

To the extent that phreatophication exists or can be documented in the areas adjacent to the principal challenge, it does mark that portion of the area of the "subflow" zone. If it extends to the lateral edge of the saturated floodplain Holocene alluviam, then it is a vital marker. However, even phreatophytes cannot tell the difference between floodplain alluvium and tributary aquifer alluvium and, therefore, can be a false marker. The boundaries of the riparian zones are helpful and certainly within the "subflow" zones if they do not extend over onto the top of tributary aquifer or basin fill. After consideration of flow direction, water level elevation, the gradation of water levels over a stream reach, the chemical composition if available, and lack of hydraulic pressure from tributary aquifer and basin fill recharge which is perpendicular to stream and "subflow" direction, the Court finds the most accurate of all the markers is the edge of the saturated floodplain Holocene alluvium.

E. The Saturated Floodplain Holocene Alluvium

Throughout the hearings, field trip and later briefing, the parties have used the terms Holocene, younger alluvium, and floodplain alluvium interchangeably. This Court believes the proper terminology for the geologic unit which defines "subflow" is the "saturated floodplain Holocene alluvium." That term is used deliberately. Both the Holocene or younger alluvium and the basin fill are descended from the same source, the rock of uplifting mountains. While the depositional processes were somewhat different, where these units meet it is sometimes difficult to discern the differences between one type of

eroded, depositional debris from another, particularly when they may both be saturated and water bearing. Moreover, water, when it fills the porosity of a geologic unit, doesn't know the difference between what is "subflow," younger alluvium or basin fill. However, only the younger Holocene alluvium can pass the test of "subflow" as it is the only stable geologic unit which is beneath and adjacent to most rivers and streams, except those in the mountains where bedrock surrounds the flow.

Also, in order to fulfill the definition of "subflow," the geologic unit must be saturated because of the need for a hydraulic connection between the stream and the "subflow." Further definition requires "subflow" to be a part of the surrounding floodplain of the stream basin. Those parts of the alluvial plain which it may be a part of or which it is connected to must be the alluvial plain of a perennial or intermittent stream and *not* an ephemeral stream or a part of the alluvial plain of a tributary aquifer even if there is an alluvial connection. Where the alluvial plain of tributary aquifers or ephemeral streams connects to the floodplain Holecene alluvium of the stream itself and provides tributary or basin fill recharge, that tributary aquifer must also be excluded because its flow direction is different and often perpendicular to the streamflow direction.

The evidence here shows that the only true geologic unit which is beneath and adjacent to the stream is the floodplain Holocene alluvium. When it is saturated, that part of the unit qualifies as the "subflow" zone, where the water which makes up the saturation flows substantially in the same direction as the stream, and the effect of any

side discharge form tributary aquifers and basin fill is overcome or is negligible. Because low-flow streams like the San Pedro meander back and forth in a series of "S" curves within a wider principal or dynamic channel, flow direction must be the general overall direction of the stream. As Steve Erb testified, as long as the subflow's direction is within 45 degrees of that general stream flow direction, the flow direction requirement is met.

If we add the following additional criteria, then even more certainty and reliability is provided. *First*, the water level elevation of the "subflow" zone must be relatively the same as the stream flow's elevation. *Second*, the gradient of these elevations for any reach must be comparable with that of the levels of the stream flow. *Third*, there must be no significant difference in chemical composition that cannot be explained by some local pollution source which has a limited effect. *Fourth*, where there are connecting tributary aquifers or floodplain alluvium of ephemeral streams, the boundary of the "subflow" zone must be a least 200 feet inside of that connecting zone so that the hydrostatic pressure effect of the side recharge of this tributary aquifer is negligible and the dominant direction of flow is the stream direction. *Fifth*, where there is a basin-fill connection between saturated zones of the floodplain Holocene alluvium and a saturated zone of basin fill, the boundary of the "subflow" zone must be 100 feet inside of the connecting zone so that the hydrostatic pressure effect of the basin-fill's side discharge is overcome and the predominant direction of flow of all of the "subflow" zone is the same as the stream's directional flow. The different distances used to overcome the side pressure of the tributary aquifer and basin fill are based

on the testimony of Steve Erb given on February 14, 1994 and the different rates of permeability and transmissivity of the different geological units. Appendix Q attached is a copy of exhibit 266 received at trial which represents the best illustration of the relationship of the "subflow" within a reach of floodplain alluvium and basin fill. Appendix R attached shows the relationship of the saturated stream alluvium of the San Pedro and its two tributaries, the Bobocamari and the Aravaipa, to the entire basin of the San Pedro.

The weight of the evidence points to the saturated floodplain Holocene alluvium as the most credible "subflow" zone. Its lateral and vertical limits have existed for some 10,000 or more years. It has far more stability of location than any other proposal including the principal channel which changes approximately every three years, or the post-1880 depositional layer which is really "post-1937" at best, or "post-1955" as indicated in the Hereford Report (exhibit 190 page 8).

It may be true that the surface of the latest layer of deposition resulting from the January 1993 flood is more permeable than the overall permeability of the entire Holocene. But, as Ford, Page, Gookin and Erb testified, and all the drill log results show, there is no significant difference in permeability between the post-1937 layer and the balance of the Holocene. Even the claims by the groundwater users of cementation in the Holocene do not stand up. Not a single drill log supports it. All the claims of the use of the wrong drilling bit do not support it. Even Dr. Montgomery's Report of October 2, 1987 refutes it. While there may be some evidence of cementation in certain layers, there is no evidence it is unit-wide, or that

it makes any significant difference in permeability or transmissivity. Therefore, regardless of claims to the contrary, the weight of this evidence supports the saturated floodplain Holocene alluvium as the "subflow" zone.

"CONES OF DEPRESSION"

"In re Gila," page 391 of 175 Ariz., describes a "cone of depression" as the "funnel-shaped area around a well, where the water table has been lowered by the withdrawal of groundwater through the well." That clinical description of a "cone of depression" tells us little of the destructive ability of wells upon basin and range streams in a desert or semi-desert environment such as the Santa Cruz River and the San Pedro River.

On February 1, 1994 Dr. Maddock discussed the "cone of depression" in the Sierra Vista area. He referred to it as "notorious." His computer modeling predicted that 37% of the water which comes from the well systems which serve the area comes out of the San Pedro which is either in the stream or on the way to the stream. He estimated the latter portion to be 1%. Exhibit 163 in evidence is his illustration of how the "cone of depression" in that area has grown since 1968. It clearly shows and the testimony was that the "cone" is in excess of five miles. A copy of Dr. Maddocks' exhibit is attached as Appendix S. In his opinion, the "cone of depression" has clearly intersected the stream.

Mr. Erb testified on February 15 that the Tenneco agricultural wells, shown on exhibit 271 in evidence, which location runs from the border twenty miles north, were shut down in the mid-1980s when Tenneco sold its

holdings to the BLM for the creation of the San Pedro River National Conservation Area. The drawdown of these wells had turned some parts of the river in this area from perennial to intermittent, and some sections were even ephemeral. After more than eight years of shut down, only one mile of the river is now more perennial than before. On our field trip, however, we found no ephemeral sections and all were at least intermittent. Local residents explain that the large January 1993 flood created large basin-wide recharge and the higher flows observed may be the result of that recharge. A copy of exhibit 271 is attached as Appendix T showing the relationships of the wells in the area to the river. The wells adjacent to the areas of discontinued irrigation are the former Tenneco wells.

What these facts show is that "cones of depression" have long-term effects even after the wells are shut down. Two recent Colorado cases make that clear. *Danielson v. Castle Meadows*, 791 P.2d 1106 (Colo. 1990) and *State Engineer v. Castle 6 Meadows*, 856 P.2d 406 (Colo. 1993) discuss the long-term effect of post-pumping depletion. In the "Danielson" case the trial court had found that post-pumping depletions could continue up to and after 200 years. In the remanded trial which took place in 1991, the trial court found the post-pumping depletions could continue up to and after 400 years. In both cases the Colorado Supreme Court found that these post-pumping depletions had to be remedied by the pumps to protect surface water users under COLO. REV. STAT. § 37-90-137(9)(c). In Colorado, augmentation plans, which are approved by the water decree, are used to remedy possible harm to other appropriations.

All of the principal witnesses agreed that even wells located outside of a steam's "subflow" could, over time, build up extensive "cones of depression" which could severely affect the volume of stream flow and the "subflow" which supported it. Even Dr. Montgomery agreed the Santa Cruz was a dead river except where Nogales' effluent created some perennial but polluted flow. This, all agreed, was the result of overpumping, often outside of anyone's "subflow" parameters. Often those wells had extensive and interconnecting "cones of depression." Appendix U, V, W, X, Y and Z attached, are copies of diagrams from exhibit 1 received in evidence at trial and illustrate the effects of "cones of depression."

In the "In re Gila" opinion only one paragraph relates to "cones of depression." It is worth repeating:

> "For example, if the cone of depression of a well has expanded to the point that it *intercepts* a stream bed, it *almost certainly* will be *pumping subflow.* At the same time, however, it may be drawing water from the surrounding alluvium. Thus, part of its production may be appropriable subflow and part of it may not. *Even though only a part of its production is appropriable water, that well should be included in the general adjudication."* (p. 391 of 175 Ariz.) (emphasis supplied)

The testimony seemed unanimous that consistent with the Supreme Court's pronouncement, if a "cone of depression" of a well intercepts what is eventually defined as the "subflow" zone, then at least some percentage of the water discharged by the well is water subject to the adjudication. As Montgomery admitted,

stream depletion occurs as soon as the "cone of depression" reaches the stream, even though it may be some time before the hydraulic gradient at the river is reversed, and may be many years before a particle travels from the stream to the well. *See* Tr. VI at 14, 49-50. Ford and Page contend that streamflow depletion first takes place when the cone intersects the stream, not when the hydraulic gradient is reversed or the molecule of streamflow is ejected by the well. Tr. I at 47 (Ford); Tr. II at 182 (Page). It is beyond dispute that even before the gradient is reversed, a measurable drawdown at the stream's "subflow" zone necessarily results in water leaving the zone in order to fill the void which has been created by the well. Ford's Report, exhibit 1, at 51 [when the cone intersects the "subflow" zone, it "induce[s] subflow to leave (deplete the Subflow Zone and the stream")]. This is true even where the gradient has not been reversed everywhere between the well and the stream. (Ford's Report at 63-67, especially Fig. 9.3 and Table 9.3)

The groundwater pumpers' position cannot be reconciled with the Supreme Court's unequivocal conclusion that when a "cone of depression" is intersecting the stream bed, it "*almost certainly*" is "pumping subflow." Apart from their molecule and gradient arguments, no serious opposition has been offered to the approach which was proposed by Ford or Page for handling wells located outside the "subflow" zone. In fact, there appears to be substantial agreement on most points.

For example, Montgomery agreed with Ford that various analytical or modeling methods are appropriate to calculate "cones of depression." Tr. I at 52 (Ford); Ford's Report at 3, 51, C-1 – C-7; Tr. IV at 18-19 and Tr. VI at 13

(Montgomery). Similarly, Ford and Montgomery agree that the calculation of the cone should be based upon the well's entire history of pumping. Tr. I at 52, 54-57 (Ford): Tr. VI at 128-29 (Montgomery). They also agreed that individual analysis of wells is the most appropriate method to compute drawdown at the "subflow" zone. Tr. I at 85 (Ford); Ford's Report, p. 37; Tr. VI at 24 (Montgomery). How this is to be done must be left to the discretion of ADWR as this Court finds there was not testimony of how technically certain determinations were to be made scientifically.

While Salt River Project proposes that a drawdown of 0.1 foot be used for purposes of calculating the "cone of depression," this Court believes such close measurements are difficult, at best, in the field. Rather, it believes that whatever test ADWR finds is realistically adaptable to the field and whatever method is the least expensive and delay-causing, yet provides a high degree of reliability, should be acceptable. While several of the experts arrived at different conclusions, Ford, Page, Montgomery, Erb and Stephenson all testified to a degree that the Court feels assured that scientific method is available to determine below-ground saturation, water level, elevation, gradient, flow direction and extent of "cones of depression."

The Court finds, subject to any *de minimis* standard later to be adopted by the Court, that any well located outside the "subflow" zone that now pumps any percentage of water either from the stream itself or its "subflow" zone, should be included in the adjudication and the total amount of water withdrawn subjected to this proceeding. If we wait until actual water molecules from the San

Pedro River are discharged from the many wells which surround it but are not in the "subflow" zone, there may not be sufficient stream flow left to justify this entire adjudication.

PRESUMPTION AND BURDEN OF PROOF

"In re Gila" on page 392 of 179 Ariz. says:

> "If DWR uses the proper test and relies on appropriate criteria for determining whether a well meets the test, its determination that a well is pumping appropriable subflow constitutes clear and convincing evidence. It is consistent with Arizona law, then, to require the well owner to come forward with evidence that DWR is wrong."

This Court agrees that the entire process of the adjudication requires that the independent evaluations of ADWR are entitled to a presumption in their favor and the property owner or an objector to a claim supported by an HSR has the duty to come forward with evidence to overcome that presumption. However, there are questions in the mind of this Court after hearing long periods of evidence over the last fourteen years. They are whether the quality of geologic or hydrologic opinion, the frequent lack of data, and the many assumptions which cannot be fully proven support a requirement that the property owner or objectors should have to overcome a clear and convincing level of burden of proof. Every expert who has attempted to develop opinions as to "cones of depression" often relies on assumptions which are not provable or are only partially provable. The conflicts between Montgomery, Schumm, Ford, Page and Erb in that specific area raise

real concern as to the fairness of raising the evidentiary level of burden of proof to clear and convincing for a property owner or objector to overcome a DWR opinion in an HSR. Even if we eliminate many of our *pro per* claimants with a proper *de minimis* rule, this is probably too formidable a barrier for the remainder of those *pro per* parties. It is often too much for represented parties of modest wealth. Only when we get to parties such as the mines, United States, Salt River Project, the State of Arizona and cities of major size are there sufficient assets of fund such evidentiary battles. At least in the area of "cones of depression" a burden of proof of preponderance seems fairer. The same is probably also true in the area of a "subflow" zone determination.

CONCLUSION

The issues here are geologically, hydrologically and factually complex. While courts often deal with complex issues, reviewing appellate courts sometimes are unable to glean from the briefs little more than a summary of the complex evidentiary background and the scientific principles which led to the trial court's decision. To overcome this limitation in this proceeding, this Court believes it has a duty to provide as much detail as it can to explain the factual decisions made, the scientific principles relied on, as well as to provide copies of many of the exhibits considered. It has done that here.

Finally, the length and complexity of this decision requires a summarization of the Court's findings as to "subflow" and dealing with "cones of depression."

1. A "subflow" zone is adjacent and beneath a perennial or intermittent stream and not an ephemeral stream.

2. There must be a hydraulic connection to the stream from the saturated "subflow" zone.

3. Even though there may be a hydraulic connection between the stream and its floodplain alluvium to an adjacent tributary aquifer or basin-fill aquifer, neither of the latter two or any part of them may be part of the "subflow" zone.

4. That part of the floodplain alluvium which qualifies as a "subflow," beneath and adjacent to the stream, must be that part of the geologic unit where the flow direction, the water level elevations, the gradations of the water level elevations and the chemical composition of the water in that particular reach of the stream are substantially the same as the water level, elevation and gradient of the stream.

5. That part of the floodplain alluvium which qualifies as a "subflow" zone must also be where the pressure of side recharge from adjacent tributary aquifers or basin fill is so reduced that it has no significant effect on the flow direction of the floodplain alluvium. (i.e., a 200-foot setback from connecting tributary aquifers and a 100-foot setback from the basin-fill deposits).

6. Riparian vegetation may be useful in marking the lateral limits of the "subflow" zone particularly where there is observable seasonal and/or diurnal variations in stream flow caused by transpiration. However, riparian vegetation on alluvium of a tributary aquifer or basin fill

cannot extend the limits of the "subflow" zone outside of the lateral limits of the saturated floodplain Holocene alluvium.

7. All wells located in the lateral limits of the "subflow" zone are subject to the jurisdiction of this adjudication no matter how deep or where these perforations are located. However, if the well owners prove that preformations are below an impervious formation which preclude "drawdown" from the floodplain alluvium, then that well will be treated as outside the "subflow" zone.

8. No well located outside the lateral limits of the "subflow" zone will be included in the jurisdiction of the adjudication unless the "cone of depression" caused by its pumping has now extended to a point where it reaches an adjacent "subflow" zone, and by continual pumping will cause a loss of such "subflow" as to affect the quantity of the stream.

Dated this 30th day of June, 1994.

/s/ Stanley Z. Goodfarb
Hon. Stanley Z. Goodfarb

LIST OF DOCUMENTS APPENDED TO ORDER OF THE SUPERIOR COURT OF THE STATE OF ARIZONA IN AND FOR THE COUNTY OF MARICOPA, FILED JUNE 30, 1994

Appendix Item	Description of Document
A	Page 71 of San Pedro River HSR [Hydrographic Survey Report].
B	Page 250 of San Pedro River HSR [Hydrographic Survey Report].
C-1	Page 252 of San Pedro River HSR [Hydrographic Survey Report].
C-2	Page 253 of San Pedro River HSR [Hydrographic Survey Report].
C-3	Page 254 of San Pedro River HSR [Hydrographic Survey Report].
D	San Pedro Watershed Study Transects
E-1	Exhibit 313. DWR Analysis of San Pedro River Channel Changes from 1935 to 1990.
E-2	Exhibit 313. [Tables Referencing Lewis Spring, Fairbank, Land, and Benson Photos.]
E-3	Exhibit 313. Paul L. Sale Property Channel Shift approximately 950 feet as determined from previous mapping and communication with the property owner.
E-4	Exhibit 365. DWR San Pedro River Study Transects – Channel Change.

E-5	Exhibit 365 [Untitled table referencing channels]
E-6	Exhibit 365 [Untitled table referencing channels]
E-7	Exhibit 365 [Untitled table referencing channels]
E-8	Exhibit 331. Table of Reported Distances along 28 Transects Identified by Arizona Department of Water Resources from 1935 and 1990, Aerial Photographs of the San Pedro River.
F-1	Exhibit 313. DWR Analysis of Change in Riparian Habitat along the San Pedro River from 1935 to 1990.
F-2	Exhibit 313. [Tables Referencing Lewis Spring, Fairbank, Land, and Benson Photos].
F-3	Exhibit 313. [Tables Referencing Galleta Flats East, Wildhorse Mnt. And Clark Ranch Photos].
G	Upper San Pedro River, Arizona. Figure 1. The study area in southeast Arizona.
H	Photograph 4. San Pedro River Map 1 (Near Palominas) about 2 miles Northeast from Palominas, View Toward East.
I	Photograph 6. San Pedro River Map 1 (Near Palominas) about 2 miles Northeast from Palominas, View Toward West.
J	Photograph 7. San Pedro River Map 1 (Near Palominas) about 1 mile South from Hereford, View Toward Southwest.

K	Photograph 11. San Pedro River Map 5 (Near Cascabel) about 7 miles Southeast from Cascabel, View Toward East.
L	Photograph 12. San Pedro River Map 6 (Near Redington) about 8 miles North from Redington, View Toward North.
M	Photograph 13. San Pedro River Map 7 (Near San Manuel) about 3 Miles Northeast from San Manuel, View Toward Northwest.
N	Photograph 14. San Pedro River Map 7 (Near San Manuel) about 1 mile South from Mammoth, View Toward Northeast.
O-1	Exhibit 317. Comparison of 1935 San Pedro River Channel and Montgomery's Post-1880 Entrenchment near Benson.
O-2	Exhibit 338 [Untitled Topographic Map]
O-3	Exhibit 319. Extent of Entrenchment of San Pedro River. Vicinity of Pomerene Canal Company Dam.
O-4	Exhibit 320. Extent of Entrenchment of San Pedro River. Vicinity of AWDR Exhibit 260.
O-5	Exhibit 325. Extent of Entrenchment of San Pedro River. Vicinity of Paul Sale Property.
O-6	Exhibit 332. Physical Relation between "Sandy Wash" Locations in 1935 and 1990 Based on Arizona Department of Water Resources Reported Distances in feet, and Lateral Extent of Post-1880 Entrenchment Channel Based on Hearing Exhibit Numbers 209 and 210 for Transects 2a, 2b, 2c, 2d, 3a, and 3b.
O-7	Exhibit 333. Physical Relation between "Sandy Wash" Locations in 1935 and 1990

Based on Arizona Department of Water Resources Reported Distances in feet, and Lateral Extent of Post-1880 Entrenchment Channel Based on hearing Exhibit Numbers 210 and 211 for Transects 3c, 3d, 4a, 4b, 5a, 5b, and 5c.

O-8 Exhibit 334. Physical Relation between "Sandy Wash" Locations in 1935 and 1990 Based on Arizona Department of Water Resources Reported Distances in feet, and Lateral Extent of Post-1880 Entrenchment Channel Based on Hearing Exhibit Numbers 212 and 213 for Transects 6a, 6b, 6c, 6d, 7a, 7b, 7c and 7d.

O-9 Exhibit 335. Physical Relation between "Sandy Wash" Locations in 1935 and 1990 Based on Arizona Department of Water Resources Reported Distances in feet, and Lateral Extent of Post-1880 Entrenchment Channel Based on Hearing Exhibit Number 215 for Transects 8a, 8b, 8c, 9a, 9b, and 9c.

P Exhibit 2. Lateral Channel Migration in the San Pedro River.

Q Exhibit 266. Hydrogeology of the Benson Area.

R Exhibit 1. San Pedro Watershed.

S Exhibit 163. Drawdown since substantial pumping started in 1940.

T Exhibit 271. Discontinued Irrigation within SPRNCA.

U Exhibit 1. Cone of Depression and Drawdown.

V Exhibit 1. Cones of Depression for High and Low Transmissivity Aquifers.

W Exhibit 1. Sources of Recharge to Aquifers.

X Exhibit 1. Drawdown that Results when Cones of Depression Overlap.

Y Exhibit 1. Ground Water Divide Between Two Wells.

Z Exhibit 1. Overlapping Cones of Depression Near a Stream.

APPENDIX C

857 P.2d 1236
175 Ariz. 382

In re the GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN the GILA RIVER SYSTEM AND SOURCE.

Nos. WC-90-0001-IR, WC-90-0001-IR to WC-90-0007-IR and WC-79-0001 to WC-79-0004.

Supreme Court of Arizona, En Banc.

July 27, 1993.

Jennings, Strouss & Salmon by M. Bryon Lewis, John B. Weldon, Jr., Lisa M. McKnight and Stephen E. Crofton, Phoenix, for Salt River Project, Salt River Valley Water Users' Ass'n.

John D. Leshy and Dale E. Pontius, Washington, DC, for the Nature Conservancy.

O'Connor, Cavanagh, Anderson, Westover, Killingsworth & Beshears by Ralph E. Hunsaker, Phoenix, for Church of Jesus Christ of Latter Day Saints; and Peabody Coal Co., amicus curiae.

John S. Schaper, Phoenix, for Buckeye Irr. Co. and Buckeye Water Conservation & Drainage Dist.

Alicia F. Tocco, Phoenix, for Vanosdell Farms.

Roderick G. McDougall, Phoenix City Atty. by M. James Callahan and Katherine Ott Verburg, Phoenix, for City of Phoenix.

Snell & Wilmer by Robert B. Hoffman and Carlos D. Ronstadt, Phoenix, for Arizona Public Service Co., Magma Copper Co., and Farmers Inv. Co.

Shiela B. Schmidt, Phoenix, for Arizona Public Service Co.

Fennemore Craig, P.C. by James W. Johnson and Lauren J. Caster, Phoenix, for Cyprus Christmas Min. Co., Cyprus Miami Min. Co., Cyprus Pima Min. Co., Cyprus Sierrita Min. Co., and Cyprus Twin Buttes Min. Co.

Ellis, Baker & Porter, P.C. by William D. Baker, Teresa H. Foster and Paul R. Orme, Phoenix, for Cent. Arizona Irr. & Drainage Dist., Maricopa-Stanfield Irr. & Drainage Dist., New Magma Irrigation & Drainage Dist.

Brown & Brown by David Albert Brown, Saint Johns, for Little Colorado Water Ass'n, amicus curiae.

Frederick S. Dean, Tucson City Atty. by Frederick S. Dean and Loretta Humphrey, Tucson, for City of Tucson.

Ryley, Carlock & Applewhite, P.A. by George Read Carlock, Michael J. Brophy, Sheryl A. Taylor and Barry R. Sanders, Phoenix, for Roosevelt Water Conservation Dist.

Quarles & Brady & Fannin by William H. Anger and Daniel L. Muchow, Phoenix, for Cities of Chandler, Glendale, Mesa and Scottsdale.

Apker, Apker, Haggard & Kurtz by Burton M. Apker, Jerry L. Haggard and Gerrie Apker Kurtz, Phoenix, for Asarco Inc. and Phelps Dodge Corp.

Steptoe & Johnson by Bruce Babbitt, Monica L. Goebel, Steven M. Hoffman and David J. Bodney, Phoenix, for Verde Valley Claimants.

United States Dept. of Justice by Gary B. Randall, Steven E. Carroll, Robert L. Klarquist, F. Patrick Barry,

Dirk D. Snel and William H. Swan, Washington, DC, for the U.S.

Burch & Cracchiolo, P.A. by Edwin C. Bull and Daryl D. Manhart, Phoenix, for Roosevelt Irr. Dist.

Grant Woods, Atty. Gen. by Joseph E. Clifford, III, Carol L. Sacks and Cynthia M. Chandley, Phoenix, for State of Ariz.

Cox and Cox by Alfred S. Cox, Z. Simpson Cox, and Alan J. Cox, Phoenix and Rodney B. Lewis, Sacaton, for Gila River Indian Community and Silas Kisto.

Lewis and Roca by Tom Galbraith and Paul D. Ellsworth, Phoenix, for Paloma Inv. Ltd. Partnership.

David R. Merkel, Tempe City Atty. by Karen S. Gaylord, Tempe, for City of Tempe.

Perry, Pierson & Kolsrud by Mark S. Sifferman, Phoenix, for Tenneco West, Inc. and Tenneco Arizona Properties Corp.

Greene, Meyer & McElroy by Scott McElroy, Boulder, CO, for the Navajo Nation.

Kimball & Curry, P.C. by Dalva L. Moellenberg and D. Lee Decker, Phoenix, for Apache Nitrogen Products, Inc. and Arizona Rock Products Ass'n, amicus curiae.

Douglas C. Nelson, Phoenix, for Gila Bend-Dendora Valley Water Users Ass'n.

Jennele Morris O'Hair, Casa Grande, for Cities of Benson and Sierra Vista, and Town of Mammoth.

Riney B. Salmon, II and Augustine Jimenez, III, Phoenix, for Maricopa County Mun. Water Conservation Dist. and San Carlos Irr. & Drainage Dist.

Sparks & Siler by Joe P. Sparks, Kevin T. Tehan, and John H. Ryley, Scottsdale, for San Carlos Apache Tribe of Arizona, Tonto Apache Tribe, Yavapai Apache Indian Community, and Camp Verde Reservation.

Meyer, Hendricks, Victor, Osborn & Maledon by Lee H. Storey and Jay I. Moyes, Phoenix, for Rio Rico Properties, Inc.

Martinez & Curtis, P.C. by William P. Sullivan and Michael A. Curtis, Phoenix, for Town of Wickenburg, Town of Gilbert, Cortaro-Marana Irr. Dist., Pima County, Ariz., Cortaro Water Users' Ass'n, Bella Vista Water Co., Inc., Bella Vista Ranches Ltd. Partnership, and Valencia Water Co., Inc.

Pamela L. Vining and Beus, Gilbert & Morrill by Lisa M. Martin, Phoenix, for represented claimants.

Sonosky, Chambers & Sachse by Harry R. Sachse and William R. Perry, Washington, DC, and Office of the Gen. Counsel by Michael P. O'Connell, Kykotsmovi, for the Hopi Tribe, amicus curiae.

OPINION

FELDMAN, Chief Justice.

This appeal presents the second of six issues accepted for interlocutory review on December 11, 1991. We decide today whether the trial court erred in adopting a test to determine whether the underground water known as

subflow is appropriable under A.R.S. § 45-141. We have jurisdiction pursuant to A.R.S. § 45-252 and ARIZ. CONST. art. 6, § 5(3).

FACTS AND PROCEDURAL HISTORY

This case is a consolidated general adjudication brought under A.R.S. § 45-251 *et seq.* to determine the extent and priority of the rights of all persons to use water in the Gila River system and source. For the full procedural history of the case, see *Arizona v. San Carlos Apache Tribe of Arizona*, 463 U.S. 545, 103 S.Ct. 3201, 77 L.Ed.2d 837 (1983); *United States v. Superior Court*, 144 Ariz. 265, 270-71, 697 P.2d 658, 663-64 (1985), *In re Rights to the Use of the Gila River*, 171 Ariz. 230, 232-33, 830 P.2d 442, 444-45 (1992). For the present opinion, the relevant facts are brief.

For five days in October 1987, the trial court held hearings on the relationship between surface water and groundwater. Hydrologists and hydrological engineers testified and submitted reports on the relation between ground and surface water in general, and in the San Pedro and Santa Cruz watersheds in particular. The hearings were for the general education of all parties and the court, but the material adduced at the hearing was to be considered evidence on which the court could rely when appropriate.

Following the hearings, several cities[1] filed a Motion to Exclude Wells From the General Adjudication, asking

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[1] Those cities were Chandler, Tempe, Mesa, Scottsdale, Glendale, Peoria, Goodyear, Casa Grande, Avondale, Nogales,

the trial court to exclude from the adjudication all wells pumping percolating groundwater, and to include only those wells pumping surface flow and subsurface flow, within the meaning of *Maricopa County Municipal Water Conservation District No. One v. Southwest Cotton Co.*, 39 Ariz. 65, 4 P.2d 369 (1931) ("*Southwest Cotton* "). The trial court decided to use the cities' motion, and the information developed at the hearings, as a vehicle to resolve several surface water and groundwater issues. Thus, in January 1988, the trial court ordered the parties to brief eight specific questions it believed it could decide as a matter of law based on the evidence adduced at the October 1987 hearings. In May 1988, the trial court heard argument and in September it issued its order answering those questions.

One of the eight questions the trial court answered in its September order was:

> Is ground water included within the phrase "river system and source" as it is used in A.R.S. §§ 45-141 and 45-251(4), and if so, to what extent is it included?[2]

The trial court concluded that underground water is included in the river system and source if it is a stream's

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and Prescott.

[2] A.R.S. § 45-141(A) reads:

> The waters of all sources, flowing in streams, canyons, ravines or other natural channels, or in definite underground channels, whether perennial or intermittent, flood, waste or surplus water, and of lakes, ponds and springs on the surface, belong to the public and are subject to appropriation and beneficial use as provided in this chapter.

subflow, as that term is used in *Southwest Cotton*. The effect of this ruling was to declare that groundwater pumpers extracting water within the court's definition of "subflow" were diverting water appropriable under A.R.S. § 45-141(A). Therefore, their rights to that water would depend on the priority of their appropriation, rather than on an owner's right to remove water percolating under the surface of the owner's land.

The court then concluded that certain wells withdrawing water from the younger alluvium of a stream basin should be presumed to be pumping appropriable subflow. The court instructed the Department of Water Resources ("DWR") to designate such wells in its hydrographic survey reports[3] as pumping appropriable subflow if:

> As to wells located in or close to that younger alluvium, the volume of stream depletion would reach 50% or more of the total volume pumped during one growing season for agricultural wells or during a typical cycle of pumpage for industrial, municipal, mining, or other uses, assuming in all instances and for all types of use that the period of withdrawal is equivalent to 90 days of continuous pumping for purposes of technical calculation.

The court acknowledged that this test (the "50%/90 day rule") appeared to be somewhat arbitrary but explained it was essential for use in instructing DWR in the preparation of its hydrographic survey reports. Well owners

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[3] These hydrographic survey reports are to be prepared by DWR pursuant to A.R.S. § 45-256 as part of its role as technical advisor to the trial court.

would be allowed to prove that their wells were not pumping subflow at the time of their evidentiary hearing.

Many parties sought review of this ruling pursuant to this court's Special Procedural Order Providing for Interlocutory Appeals and Certifications, filed September 26, 1989. We granted review and framed the issue as follows:

> Did the trial court err in adopting its 50%/90 day test for determining whether underground water is "appropriable" under A.R.S. § 45-141?

THE ISSUE

This issue arises from the way Arizona water law has developed from territorial days. Those seeking a detailed history of the evolution of Arizona water law, going back to the organization of the Arizona Territory, are referred to John D. Leshy & James Belanger, ARIZONA LAW WHERE GROUND AND SURFACE WATER MEET, 20 ARIZ.ST.L.J. 657 (1988). As will be seen below, rights associated with water found in lakes, ponds, and flowing streams – surface water – have been governed by the doctrine of prior appropriation. This doctrine developed in the western part of the country where the common law riparian rights doctrine was unsuited to prevailing arid conditions. On the other hand, underground water has been governed by the traditional common law notion that water percolating generally through the soil belongs to the overlying landowner, as limited by the doctrine of reasonable use. *Id.*

This bifurcated system of water rights was not unique to Arizona. It was typical of western states until around the turn of the twentieth century. At that time,

scientific investigation was revealing that most underground water is hydraulically connected to surface water. As scientific knowledge progressed, most states revised their water laws to provide for unitary management of hydraulically connected underground and surface water. Arizona, however, did not, and continues to adhere to a bifurcated system of water rights, with compelling implications for general stream adjudications. *Id.*

The purpose of a general stream adjudication under title 45 is to determine the rights of all persons to use the waters of a river system and source. A.R.S. § 45-252(A). "River system and source" is defined as "all water appropriable under [A.R.S.] § 45-141 and all water subject to claims based upon federal law." A.R.S. § 45-251(4). Thus, basic to this case is the extent to which water pumped from wells must be treated as appropriable under § 45-141 or, conversely, as groundwater excluded from the legal rules applying to prior appropriation. The need to resolve the question early in the proceeding impelled us to grant review.

HISTORICAL PERSPECTIVE

We start with *Southwest Cotton*, this court's early and most important attempt to enunciate the relative rights of groundwater and surface water users. The court's comment in that case applies to the present dispute:

> The case is one of the most important which has ever come before this court, involving as it does not only property interests of [great] value . . . but also a declaration of legal principles which will in all probability determine and govern to a great extent the course of future

> . . . development within the arid regions of Arizona. The real question involved is the law applicable to the relative rights to the ownership and use of the subterranean waters of the state as against those of the surface waters.

39 Ariz. at 71, 4 P.2d at 372.

Southwest Cotton involved a suit by Southwest Cotton Company and others ("Southwest Cotton") against Maricopa County Municipal Water Conservation District No. 1 and others ("Conservation District"). Southwest Cotton owned a large tract of land west of Phoenix. It drilled almost one hundred wells in and around the Agua Fria River bed[4] to irrigate 19,000 acres. In 1925, plans for a dam on the Agua Fria River upstream of Southwest Cotton's development matured, and the Conservation District floated bonds to finance the project. Southwest Cotton sued to enjoin the project, fearing that the upstream dam would prevent water from reaching the downstream wells.

In the trial court, Southwest Cotton argued that the water it pumped was subject to appropriation under the predecessor of A.R.S. § 45-141(A).[5] The trial court ruled for Southwest Cotton, holding that the water was appropriable as water flowing in definite underground channels.

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[4] The Agua Fria River flowed only intermittently. Southwest Cotton's wells were located in an area roughly ten miles wide and twenty miles long. Some were in the river bed, and others ranged from a few feet to six miles from the river.

[5] Southwest Cotton also claimed rights to a surface diversion in connection with a tunnel and canal system at what was known as the Marinette heading.

On appeal, Southwest Cotton advanced three theories: (1) percolating underground water was appropriable; (2) water running in underground channels was appropriable; and (3) subflow of the Agua Fria River was appropriable. This court decided to treat all issues as matters of first impression. First, it addressed Southwest Cotton's claim that percolating groundwater is appropriable. At the time of *Southwest Cotton*, percolating water was defined generally as water that passes through the ground and does not form part of a body of water or a water course. 2 Clesson S. Kinney, THE LAW OF IRRIGATION AND WATER RIGHTS § 1188, at 2152 (2d ed. 1912). It was further classified with reference to the streams or other bodies of water to which it was tributary. "Diffused percolations" were not tributary to any definite surface or underground stream or body of water. *Id.* "Percolating waters tributary to surface water" were, as the name implies, "waters which infiltrate their way through the adjoining ground to some surface water course or other body of surface water." *Id.* § 1193, at 2162.

The *Southwest Cotton* court examined Arizona statutes from 1864 and its previous decisions and reaffirmed its prior holding that percolating subterranean water was not subject to appropriation. 39 Ariz. at 84, 4 P.2d at 376. Language in the opinion makes it clear that the court meant that all percolating water, however classified, was not subject to appropriation. While distinguishing certain California cases on which Southwest Cotton relied, the court stated:

> Whether [the water underlying Southwest Cotton's land] be diffused percolations in the common law sense of the term . . . , or whether it be

> percolating waters whose extraction will tap other waters, . . . is immaterial in this instance, for neither class is subject to appropriation under the law of Arizona.

Id. at 100, 4 P.2d at 382.[6]

The court also addressed Southwest Cotton's argument that its water came from underground streams. The court rejected that argument because there was insufficient evidence to show that Southwest Cotton's wells tapped underground channels with known and definite banks from which Arizona law allowed appropriations. *Id.* at 95, 4 P.2d at 380.

Finally, the court addressed the argument that Southwest Cotton was pumping appropriable subflow of the Agua Fria River. The court defined "subflow" as

> those waters which slowly find their way through the sand and gravel constituting the bed of the stream, or the lands under or immediately adjacent to the stream, and are themselves a part of the surface stream.

Id. at 96, 4 P.2d at 380.

> In almost all cases the so-called subflow is found within, or immediately adjacent to, the bed of the surface stream itself.

Id. at 97, 4 P.2d at 381.

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[6] Any decision as to what law applied to percolating water was left for another day. *Id.* at 83-84, 4 P.2d at 376. That day arrived more than twenty years later. *See Bristor v. Cheatham*, 75 Ariz. 227, 255 P.2d 173 (1953), which established the right of the surface owner to reasonable use of the water percolating under his property.

Subflow "physically . . . constitute[s] a part of the surface stream itself, and [is] simply incidental thereto." *Id.* at 96, 4 P.2d at 380. It is subject to the same rules of appropriation as the surface stream itself. *Id.* at 97, 4 P.2d at 380-81.

The court set forth a test for determining whether underground water is appropriable subflow. First, it wrote:

> The best test which can be applied to determine whether underground waters are as a matter of fact and law part of the surface stream is that *there cannot be any abstraction of the water of the underflow without abstracting a corresponding amount from the surface stream,* for the reason that the water from the surface stream must necessarily fill the loose, porous material of its bed to the point of complete saturation before there can be any surface flow.

Id. at 96, 4 P.2d at 380 (emphasis added). In the next paragraph, the court wrote:

> Not only does [subflow] move along the course of the river, but it percolates from its banks from side to side, and the more abundant the surface water the further will it reach in its percolations on each side. But, considered as strictly a part of the stream, the test is always the same: *Does drawing off the subsurface water tend to diminish appreciably and directly the flow of the surface stream?* If it does, it is subflow, and subject to the same rules of appropriation as the surface stream itself; if it does not, then, although it may originally come from the waters of such stream, it is not, strictly speaking, a part thereof, but is

> subject to the rules applying to percolating waters.

Id. at 96-97, 4 P.2d at 380-81 (emphasis in original).

Concluding that there was no evidence that Southwest Cotton's pumping directly or appreciably diminished the flow of the river, the court reversed and remanded the case for a new trial. *Id.* at 99, 106, 4 P.2d at 381, 384.

Until *Bristor v. Cheatham*, 73 Ariz. 228, 240 P.2d 185 (1952) ("*Bristor I* "), this court consistently applied *Southwest Cotton's* rule that percolating groundwater is not subject to appropriation. In *Bristor I*, the court held by a 3-2 margin that percolating water was subject to appropriation. The court granted rehearing, however, and fourteen months later reversed itself by a 3-2 margin. In *Bristor v. Cheatham*, 75 Ariz. 227, 255 P.2d 173 (1953) ("*Bristor II* "), the majority reaffirmed our prior holdings that percolating water is not subject to appropriation. Arizona's courts have followed *Bristor II* to this day.

DISCUSSION

The parties in this appeal generally agree that *Southwest Cotton* is at the heart of the issue before us. One group argues that *Southwest Cotton's* concept of subflow is narrow, and that the 50%/90 day rule is too broad, because it includes wells that pump underground water not appropriable under A.R.S. § 45-141(A). Another group argues that *Southwest Cotton's* concept of subflow is broad, and that the 50%/90 rule is too narrow, because it fails to include all wells that pump appropriable subflow. The third group argues that the trial court was correct.

Although it seems to agree that the 50%/90 day rule is not faithful to *Southwest Cotton*, the third group contends that the trial court's order should not be disturbed because it merely creates a rebuttable presumption. We address this argument first.

A. The presumption

The 50%/90 day rule was formulated to instruct DWR in the preparation of hydrographic survey reports, and merely creates a rebuttable presumption that wells meeting the test are pumping subflow. Nonetheless, if the test is defective, its use would adversely affect the adjudication. It would plant errors in every hydrographic survey report, which would have to be litigated according to the procedures set out in the Rules for Proceedings Before the Special Master, Rules 6.00-16.00. This would exacerbate an already lengthy and costly process. Perhaps even more significantly, use of a flawed test for identifying wells pumping subflow could cause significant injustice. Many surface owners unable to mount a challenge could effectively lose their right to pump percolating groundwater, simply because their wells were improperly presumed to be pumping appropriable subflow. Considering the time, expense, and importance of accurate hydrographic survey reports, and the complex lawsuits over their correctness, it would be a senseless waste to use a flawed presumption for identifying wells pumping subflow.

B. Applying the rule of Southwest Cotton

1. *Stare decisis*

We now determine whether the trial court's 50%/90 day rule accurately reflects *Southwest Cotton's* subflow rationale. We perceive our role as interpreting *Southwest Cotton*, not refining, revising, correcting, or improving it. We believe it is too late to change or overrule the case. More than six decades have passed since *Southwest Cotton* was decided. The Arizona legislature has erected statutory frameworks for regulating surface water and groundwater based on *Southwest Cotton*. Arizona's agricultural, industrial, mining, and urban interests have accommodated themselves to those frameworks. *Southwest Cotton* has been part of the constant backdrop for vast investments, the founding and growth of towns and cities, and the lives of our people. Of course, this court is not absolutely bound by *stare decisis* and may change judge-made law, especially when the need for change is apparent, the error or confusion in previous decisions is evident, and change is possible without causing significant damage. We have done so in the recent past. *See Wiley v. Industrial Commission*, 174 Ariz. 94, 847 P.2d 595 (1993). We do not do so lightly, however, or in the absence of compelling reasons. *State v. Huerta*, ___ Ariz. ___, 855 P.2d 776 (1993); *cf. State v. Lara*, 171 Ariz. 282, 285, 830 P.2d 803, 806 (1992).

If this principle applies to ordinary cases, it must be applied with particular care when the prospective effect of change threatens important vested rights and may affect every Arizonan's well-being. Thus, even though *Southwest Cotton* may be based on an understanding of

hydrology less precise than current theories, it would be inappropriate to undo that which has been done in the past. Instead, we will attempt only to resolve as best we can the ambiguities and uncertainties left by that decision. Given the inexact nature of the "direct and appreciable diminution" test laid down by *Southwest Cotton*, that in itself is no small task.

2. *Application*

Those who argue that the 50%/90 day rule is too narrow suggest that *Southwest Cotton's* test is very broad. They argue that pumping underground water from a tributary aquifer[7] causes direct stream depletion, either by intercepting water that otherwise would reach the stream or by de-watering an area, thereby inducing water to flow from the stream to fill the void. Such depletion is "appreciable," the argument goes, if it is "[c]apable of being estimated . . . or recognized . . . [;] perceptible." Citing OXFORD ENGLISH DICTIONARY (2d ed. 1989). These parties contend that any well pumping from a tributary aquifer is pumping subflow if it causes any measurable stream depletion in a period of one or more decades.[8] Viewed outside the context in which the *Southwest Cotton*

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[7] A tributary aquifer is an aquifer having a direct hydraulic connection with a stream or with another aquifer that has such a connection.

[8] The lead brief for those arguing that the test is too narrow suggests a period of ten years. The brief filed by the Nature Conservancy suggests a period of forty years. Both briefs allow for exclusion of wells that pump de minimis amounts of water or that have de minimis impact on surface streams.

test was formulated, that interpretation is plausible. Viewed in context, however, it clearly is too expansive from both geographical and time standpoints.

When *Southwest Cotton* was decided, subflow was a well known water law concept. The primary authority on which the *Southwest Cotton* court relied concerning subflow was 2 Kinney, *supra* § 1161. Kinney addressed the concept of subflow in Chapter 60, entitled "Subterranean Water Courses." He subdivided subterranean water courses into two general categories, known and unknown. Known subterranean water courses were those in which the channel had been identified. Unknown courses were those in which the channel had not been identified. *Id.* § 1155, at 2098-99. Known subterranean water courses were further subdivided into independent or dependent. Independent courses were those that flowed "independent of the influence of any surface streams." *Id.* § 1156, at 2100. Dependent courses were "waters . . . dependent for their supply upon the surface streams, or are the 'underflow,' 'sub-surface flow,' 'subflow,' or 'undercurrent,' as they are at times called, of surface streams." *Id.* § 1161, at 2106. Kinney's definition of subflow was the one used in *Southwest Cotton*. *See* 39 Ariz. at 96, 4 P.2d at 380.[9]

Kinney specifically discussed subflow in the context of intermittent streams, such as the Agua Fria River, at

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[9] *See also* BLACK'S LAW DICTIONARY 1425 (6th ed. 1990), defining "subflow" as "[t]hose waters which slowly find their way through sand or gravel constituting bed of a stream, or lands under or immediately adjacent to [a] stream."

issue in *Southwest Cotton*. He explained that a large volume of water flows through the sand and gravel underlying most streams in arid regions. During dry seasons, the surface of these streams may be dry, but water flows underneath the surface. This underground water is not a separate underground stream but still a part of the surface stream. 2 Kinney, *supra* § 1161, at 2106-10. Furthermore, speaking again about intermittent streams, Kinney wrote:

> [W]aters, in order to constitute the underground flow of surface streams, must be connected with the stream and strictly confined to the river bottom and moving underground, as was stated in a California case, "in connection with it, and a course with a space reasonably well defined." In other words, the water must be within the bed of the surface stream itself. Otherwise such underground waters must be classified with percolating waters, hereinafter discussed.

Id. § 1161, at 2110 (footnotes omitted).

In his later discussion of percolating water, Kinney wrote:

> Our second class of percolating waters we will define as those waters which infiltrate their way through the adjoining ground to some surface water course or other body of surface water.

Id. § 1193, at 2162 (footnote omitted). Kinney described what the parties in this case have referred to as tributary groundwater. He pointedly distinguished tributary groundwater from subflow:

> [Percolating waters tributary to surface waters] differ from the underflow of surface streams in the fact that they have not yet reached the channels of the water courses to which they are tributary; while, upon the other hand, the underflow of surface streams have reached these channels and are therefore dealt with as component parts of such streams.

Id. (footnote omitted).

Thus, Kinney defined subflow narrowly and specifically distinguished it from tributary groundwater. It is clear that we adopted that narrow definition in *Southwest Cotton*. The court's discussion of subflow, 39 Ariz. at 96-97, 4 P.2d at 380-81, is a virtual paraphrase of large portions of Kinney's discussion in § 1161, at 2106-10. Furthermore, in its answering brief Southwest Cotton made essentially the same argument that is being made in this proceeding. In a section of its brief entitled "Underground Waters Tributary to or Dependent Upon Surface Streams Subject to Appropriation as Part of the Stream," Southwest Cotton argued that underground water that is hydraulically connected – tributary – to surface water should be considered part and parcel of the surface stream. As such, it should be subject to appropriation as waters of the stream. Brief of Appellees (Conservation District) at 199-200.

The court rejected that argument, holding that all types of percolating water were not subject to appropriation under Arizona law. *Southwest Cotton*, 39 Ariz. at 84, 4 P.2d at 376. Having so held, it is unreasonable to suppose that the court then turned around and adopted a concept of subflow broad enough to include all underground

water hydraulically connected to a surface stream. It seems clear that the court considered subflow and tributary groundwater to be two different classes of underground water. The former is subject to appropriation under the predecessor of A.R.S. § 45-141(A); the latter is not.

The rehearing proceedings in *Southwest Cotton* further indicate the court's narrow view of subflow. In its petition for rehearing, Southwest Cotton argued that the court defined subflow too narrowly. It took issue with the use of the term "immediately" in the following portion of the opinion:

> The underflow, subflow, or undercurrent, as it is variously called, of a surface stream may be defined as those waters which slowly find their way through the sand and gravel constituting the bed of the stream, or the lands under or *immediately* adjacent to the stream, and are themselves a part of the surface stream.

39 Ariz. at 96, 4 P.2d at 380 (emphasis added). Southwest Cotton argued that neither Kinney nor any other text writer used the word "immediately" or any of its synonyms as a limitation on the word "adjacent." Petition for Rehearing at 22. In its opinion on rehearing, the court made no specific mention of this argument but essentially affirmed its original test for identifying subflow. *Maricopa County Mun. Water Conservation Dist. No. One v. Southwest Cotton Co.*, 39 Ariz. 367, 369, 7 P.2d 254, 254 (1932). Obviously, therefore, the court meant it when it said that in almost all cases "subflow is found within, or immediately adjacent to, the bed of the surface stream itself."

39 Ariz. at 97, 4 P.2d at 381. Subflow is a narrow concept. Thus, all water in a tributary aquifer is not subflow.

We believe the *Southwest Cotton* court drew a line between subflow as part of the stream and water in the surrounding alluvium that is either discharging into the stream or being discharged by the stream. That line is relatively close to the stream bed, with variations depending on the volume of stream flow and other variables. Thus, if a well is drawing water from the bed of a stream, or from the area immediately adjacent to a stream, and that water is more closely related to the stream than to the surrounding alluvium, as determined by appropriate criteria, the well is directly depleting the stream. If the extent of depletion is measurable, it is appreciable. This is not an all-or-nothing proposition. For example, if the cone of depression[10] of a well has expanded to the point that it intercepts a stream bed, it almost certainly will be pumping subflow. At the same time, however, it may be drawing water from the surrounding alluvium. Thus, part of its production may be appropriable subflow and part of it may not. Even though only a part of its production is appropriable water, that well should be included in the general adjudication.

We believe that the trial court's approach is inconsistent with *Southwest Cotton*. The trial court instructed DWR to apply the 50%/90 day test to all wells located in

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[10] The cone of depression is the "funnel-shaped area around a well, where the water table has been lowered by the withdrawal of groundwater through the well." 6 Robert E. Beck, ed., WATERS AND WATER RIGHTS 503 (1991).

or near the younger alluvium. The record shows, however, that in a given area the younger alluvium may stretch from ridge line to ridge line so that all wells in the valley would be in or near the younger alluvium. To say that all of an alluvial valley's wells may be pumping subflow is at odds with *Southwest Cotton's* statement that subflow is found within or immediately adjacent to the stream bed.

Likewise, the 50%/90 day "volume-time" test does not find its origin in *Southwest Cotton*. Given enough time, and with certain exceptions, all extractions from a tributary aquifer will cause a more-or-less corresponding depletion from stream flow volume. That, indeed, is the basis of the continuing controversy between groundwater pumpers and surface appropriators. *Southwest Cotton*, however, did not purport to identify subflow in terms of an acceptable amount of stream depletion in a given period of time. It sought to identify subflow in terms of whether the water at issue was part of the stream or was percolating water on its way to or from the stream.

Furthermore, the actual time and volume elements adopted by the trial court are essentially arbitrary. Under the trial court's test, a pumper extracting 1,000 acre feet, diminishing stream flow by "only" 499 acre feet within 90 days, would be presumed to be pumping groundwater, whereas a well owner extracting 100 acre feet, depleting stream flow by 51 acre feet, would be presumed to be pumping surface water. Nothing in *Southwest Cotton* or the record in this proceeding justifies so arbitrary a classification. The same, of course, is true of application of the 90-day time period. Why not 75 or 100 days?

Whether a well is pumping subflow does not turn on whether it depletes a stream by some particular amount in a given period of time. As we stated above, it turns on whether the well is pumping water that is more closely associated with the stream than with the surrounding alluvium. For example, comparison of such characteristics as elevation, gradient, and perhaps chemical makeup can be made. Flow direction can be an indicator. If the water flows in the same general direction as the stream, it is more likely related to the stream. On the other hand, if it flows toward or away from the stream, it likely is related to the surrounding alluvium. The present record certainly allows neither the trial court nor us to identify a definitive set of criteria. Furthermore, it also is likely that differences in geology and hydrology from location to location may require that different criteria be given more or less emphasis, depending on the area under analysis. The record allows neither the trial court, nor us, to make those determinations.

We conclude, therefore, that the 50%/90 day test for identifying wells presumed to be pumping subflow is inconsistent with *Southwest Cotton* and should not be used.

3. *The burden of proof*

The trial court's 50%/90 day rule created a presumption that wells meeting the test are pumping appropriable water. The burden of proof then fell on well owners to prove that their wells did not pump appropriable water. Those arguing that the 50%/90 day test is too narrow point out that under Arizona law underground water is

presumed to be percolating and that one claiming otherwise has the burden of proving the claim by clear and convincing evidence. *Neal v. Hunt*, 112 Ariz. 307, 311, 541 P.2d 559, 563 (1975); *Southwest Cotton*, 39 Ariz. at 85, 4 P.2d at 376. Thus, they conclude, the trial court's order improperly shifted to well owners the burden of proving that their wells do not pump appropriable water. We disagree. If DWR uses the proper test and relies on appropriate criteria for determining whether a well meets the test, its determination that a well is pumping appropriable subflow constitutes clear and convincing evidence. It is consistent with Arizona law, then, to require the well owner to come forward with evidence that DWR is wrong.

4. *The future*

Finally, we recognize that the line between surface and groundwater drawn by the *Southwest Cotton* court and reaffirmed by this court today is, to some extent, artificial and fluid. As discussed above, however, we do not feel free to redraw or erase that line. It is important to remember that the *Southwest Cotton* court did not create an all-encompassing set of common law principles. It purported, instead, to interpret the relevant statutes codifying the doctrine of prior appropriation and identifying the water sources to which the doctrine applied. Those statutes remain relatively intact. *See* A.R.S. § 45-141. Southwest Cotton argued at the time for a different interpretation of the statutes and the Arizona Constitution. Since *Southwest Cotton*, many have criticized Arizona's adherence to a bifurcated system of water management. *See* Leshy & Belanger, *supra*, at 657-60. Now, sixty years

later, similar arguments are made that *Southwest Cotton* misinterpreted our statutes and constitution. *See Id.* at 767-90. We recognize compelling arguments in favor of unified management of Arizona's water resources. Nonetheless, in the decades since *Southwest Cotton* was decided, the Arizona Legislature has not significantly altered the opinion's reach.

Southwest Cotton's concept of subflow added marginally to the statutory definition of water subject to appropriation, but we do not propose to rewrite the statute further by broadening the concept of subflow. We believe the trial court's 50%/90 day rule expands the clear words of A.R.S. § 45-141(A) to include not only waters flowing in streams but, potentially, waters pumped any place in the younger alluvium. The court's order does not explain the rule's derivation. The 50%/90 day rule does not comport with the tests laid down in *Southwest Cotton*. Water may be considered appropriable underflow if the "abstraction" by pumping results in "abstracting a corresponding amount from the surface stream." Considering subflow as "strictly a part of the stream, the test is always the same: *Does drawing off the subsurface water tend to diminish appreciably and directly the flow of the surface stream?*" 39 Ariz. at 97, 4 P.2d at 380 (emphasis in original).

Thus, we reaffirm *Southwest Cotton's* narrow concept of subflow. We realize this does not solve the problems of equitably apportioning all available water in the state between conflicting interests and claims of groundwater users and surface appropriators. We believe, however, that in this area of the law, as much or more than any other, any appropriate change in existing law must come

from the legislature. *See* Arizona Groundwater Code, Title 45, ch. 2; *Chino Valley v. City of Prescott*, 131 Ariz. 78, 638 P.2d 1324 (1981). That is as it should be. As we stated in *Arizona Public Service Co. v. Long*, 160 Ariz. 429, 436, 773 P.2d 988, 995 (1989):

> Regulation of water use, . . . especially in a desert state, does not lend itself to case-by-case definition. In this field, we not only confer private rights and interests but deal in the very survival of our society and its economy. Simply put, there is not enough water to go around. All must compromise and some must sacrifice. Definition of those boundaries is peculiarly a function for the legislature. It is plainly not a judicial task. Accordingly, we must look to the legislature to enact the laws they deem appropriate for wise use and management.

D. Comprehensiveness Requirement

The United States is a party to this case under the McCarran Amendment, which gives consent to suits against the United States in state court adjudications that embrace "rights to the use of water in a river system or other source." 43 U.S.C. § 666(a). The United States argues that unless this adjudication includes all water hydrologically connected to the Gila River system, it will not be comprehensive enough to satisfy the McCarran Amendment requirement that it embrace all rights to the use of water in the river system or other source. At oral argument, the United States also asserted that the trial court in this case cannot exclude wells having only a de minimis effect on the river system. We disagree.

The McCarran Amendment recognizes that any decree from a water rights adjudication would be of little value unless it joined all parties owning rights to a stream or water source, including the United States. According to Senator McCarran, who introduced the bill and chaired the reporting committee:

> S. 18 is not intended . . . to be used for any other purpose than to allow the United States to be joined in a suit wherein it is necessary to adjudicate all of the rights of various owners on a given stream. This is so because unless all the parties owning or in the process of acquiring water rights on a particular stream can be joined as parties defendant, any subsequent decree would be of little value.

United States v. District Court in and for Eagle County, Colo., 401 U.S. 520, 525, 91 S.Ct. 998, 1002, 28 L.Ed.2d 278 (1971) (quoting from S.Rep. No. 755, 82d Cong., 1st Sess., at 9 (1951)). The McCarran Amendment was not intended to impose on the states a federal definition of "river system or other source." Rather, as the Court held in *Colorado River Water Conservation District v. United States*, 424 U.S. 800, 819, 96 S.Ct. 1236, 1247, 47 L.Ed.2d 483 (1976):

> The consent to jurisdiction given by the McCarran Amendment bespeaks a policy that recognizes the availability of comprehensive state systems for adjudication of water rights as the means for achieving [the goal of avoiding piecemeal adjudication of interdependent water rights by resolving them in a single unified proceeding].

The United States has cited no authority supporting its reading of the McCarran Amendment,[11] but there is contrary precedent. In *United States v. Oregon Water Resources Department*, 774 F.Supp. 1568, 1578 (D.Ore.1991), the court wrote:

> Finally, the United States and the Tribe argue that because the adjudicative procedures of the State of Oregon do not call for simultaneous adjudication of rights to surface water and rights to groundwater within a given river system, the adjudication is not comprehensive within the meaning of the McCarran Amendment. The language of the McCarran Amendment does not support this construction, and the United States and the Tribe point to no provision in the legislative history and no case precedent, state or federal, in support of this construction of the McCarran Amendment.

This correctly states the law.

We believe that the trial court may adopt a rationally based exclusion for wells having a de minimis effect on the river system. Such a de minimis exclusion effectively allocates to those well owners whatever amount of water is determined to be de minimis. It is, in effect, a summary

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[11] The United States provided this court with a copy of an unpublished decision of a California superior court in which the court granted a federal motion to dismiss on the ground that the proceeding was not comprehensive because it did not include groundwater users. We do not find that to be persuasive authority. In any event, the California court did not base its decision on what it perceived to be a rule of general application but on the peculiar facts of the case before it.

adjudication of their rights. A properly crafted de minimis exclusion will not cause piecemeal adjudication of water rights or in any other way run afoul of the McCarran Amendment. Rather, it could simplify and accelerate the adjudication by reducing the work involved in preparing the hydrographic survey reports and by reducing the number of contested cases before the special master. Presumably, Congress expected that water rights adjudications would eventually end. It is sensible to interpret the McCarran Amendment as permitting the trial court to adopt reasonable simplifying assumptions to allow us to finish these proceedings within the lifetime of some of those presently working on the case.

CONCLUSION

We vacate the portion of the trial court's September 8, 1988 order that formulated the 50%/90 day rule. We remand the matter to the trial judge to take evidence and, by applying the principles contained in this opinion, determine the criteria for separating appropriable subflow from percolating groundwater.

MOELLER, V.C.J., CORCORAN and ZLAKET, JJ., and WILLIAM E. DRUKE, Court of Appeals Chief Judge, concur.

MARTONE, J., did not participate in the determination of this matter; pursuant to ARIZ. CONST. art. VI, § 3, the Honorable WILLIAM E. DRUKE, Chief Judge of Division Two, Arizona Court of Appeals, was designated to sit in his stead.

APPENDIX D

IN THE SUPREME COURT OF THE
STATE OF ARIZONA

IN RE THE GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN THE GILA RIVER SYSTEM AND SOURCE	) Supreme Court Nos. WC-90-0001-IR [Includes WC-90-0001-IR through WC-90-0007-IR (Consolidated) & WC-79-0001 (WC-1 through WC-4 Consolidated)]
	) ORDERS CONCERNING PETITIONS FOR INTERLOCUTORY REVIEW
	) (Filed Dec. 11, 1990)

Following the adoption of a Special Procedural Order Providing for Interlocutory Appeals and Certifications, petitions for review were filed in Maricopa County Superior Court Nos. W-1, W-2, W-3, and W-4 (consolidated). On June, [sic] 27, 1990, this Court consolidated the petitions. Thereafter, numerous cross-petitions, responses and an amicus brief were filed.

Having considered the many petitions, cross-petitions, responses and the amici briefs, the Court has determined to grant review on six issues. These issues were raised, in some form or another, in many of the filings, but have been reformulated by the Court. Thus, the individual questions presented in the petitions and cross-petitions will be ordered granted "to the extent they address the issues" the Court has decided to review and "denied in all other respects." As set forth in part H.1 of the Special

Procedural Order Providing for Interlocutory Appeals and Certifications, the Court's decision to deny review of any question has no precedential value.

Moreover, the Court intends to address these six issues separately. Thus, this order establishes a date for a pre-submittal conference at which matters relating to Issue Number 1 will be determined. Any party wishing to participate in the resolution of Issue Number 1 must file a notice of appearance no later than twenty days before that pre-submittal conference. At some later time, the Court will issue an order setting the date for the pre-submittal conference regarding the next issue. Parties wishing to participate in the resolution of that issue will file notices of appearance, and that issue will be briefed, argued and submitted. The process will proceed in this manner until all issues have been submitted and decided.

It is, therefore,

ORDERED: Granting review by way of interlocutory appeal of the following issues:

1. Do the procedures for filing and service of pleadings adopted by the trial court in its Pre-trial Order Number 1 comport with due process under the United States and Arizona Constitutions?

2. Did the trial court err in adopting its 50%/90 day test for determining whether underground water is "appropriable" under A.R.S. § 45-141?

3. What is the appropriate standard to be applied in determining the amount of water reserved for federal lands?

4. Is non-appropriable groundwater subject to federal reserved rights?

5. Do federal reserved rights holders enjoy greater protection from groundwater pumping than holders of state law rights?

6. Must claims of conflicting water use or interference with water rights be resolved as part of the general adjudication?

FURTHER ORDERED: Scheduling a pre-submittal conference regarding Issue Number 1 for Tuesday, February 12, 1991 at 10:00 a.m., as required by part H.3 of the Special Procedural Order for Interlocutory Appeals and Certifications.

FURTHER ORDERED: Any party to the adjudication desiring to participate in the interlocutory appeal of Issue Number 1 shall file a notice of appearance in this Court no later than twenty days prior to February 12, 1991, the date set for the pre-submittal conference, as required by part I of the Special Procedural Order for Interlocutory Appeals and Certifications. The notice of appearance shall indicate the party's position on the issue.

With respect to the individual petitions and cross-petitions for review:

WC-90-0001-IR **IN THE MATTER OF THE RIGHTS TO THE USE OF THE GILA RIVER vs. SALT RIVER PROJECT/SALT RIVER VALLEY WATER USERS' ASS'N**

ORDERED: Petition for Interlocutory Review [Petitioner Salt River Project]:

Issue Number 1 = Review is granted to the extent it addresses the Court's Issues

Numbers 2 & 5; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issues Numbers 4 & 5; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 4 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 5 = Review is denied.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioner Church of Jesus Christ of Latter Day Saints]:

Review is granted and denied to the same extent that the petitions of City of Glendale, Roosevelt Water Conservation District, Arizona Public Service Company, Magma Copper Company, Farmers Investment Company, Cyprus Minerals Company, Apache Powder Company, City of Phoenix, Salt River Project Agricultural Improvement and Power District and the Salt River Valley Users' Association are granted and denied.

FURTHER ORDERED: Cross-Petition of United States for Interlocutory Review [Cross-Petitioner Department of Justice]:

Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Vanosdell Farms]:

Review is granted and denied to the same extent that the petition of the Salt River Project Agricultural Improvement and Power District and the Salt River Valley Water Users' Association is granted and denied.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Gila Valley Irrigation District and Franklin Irrigation District]:

With respect to the issues in which it expressed "particular interest":

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 4 = Review is denied.

FURTHER ORDERED: Joinder in APS' Response to Petitions for an Order

Allowing an Interlocutory Appeal and Cross-Petition [Joint Respondent Central Arizona Irrigation and Drainage District, Maricopa-Stanfield Irrigation District and New Magma Irrigation & Drainage District]:

Review is granted and denied to the same extent as the petitions of Arizona Public Service Co., Magma Copper Co., Farmers Investment Co., Roosevelt Water Conservation District and the City of Glendale are granted and denied.

FURTHER ORDERED: Cross-Petition and Response to Petitions for Interlocutory Review [Respondent Claimants Town of Wickenburg, Town of Gilbert, Cortaro-Marana Irrigation District, Cortaro Water Users' Association, Valencia Water Company, Bella Vista Water Company, Inc., and Bella Vista Ranches Limited Partnership]:

Issue A = Review is granted to the extent it addresses the Court's Issues Numbers 2, 3 & 4; review is denied in all other respects;

Issue B = Review is granted to the extent it addresses the Court's Issue Number 1; review is denied in all other respects.

WC-90-0002-IR **IN THE MATTER OF THE RIGHTS TO THE USE OF THE GILA RIVER vs. BUCKEYE IRRIGATION CO. & BUCKEYE WTR CONSERVATION & DRAIN.**

ORDERED: Petition of Buckeye Irrigation Company and Buckeye Water Conservation & Drainage District to Review Portions of Superior Court Order of September 9, 1988:

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 4; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 5; review is denied in all other respects;

Issue Number 4 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 5 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 6 = Review is denied.

FURTHER ORDERED: Cross-Petition of United States for Interlocutory Review [Cross-Petitioner Department of Justice]:

Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

WC-90-0003-IR **IN THE MATTER OF THE RIGHTS TO THE USE OF THE GILA RIVER vs. CITY OF PHOENIX**

ORDERED: Petition for Interlocutory Review [Petitioner City of Phoenix]:

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is denied;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioner Church of Jesus Christ of Latter Day Saints]:

Review is granted and denied to the same extent that the petitions of City of Glendale, Roosevelt Water Conservation District, Arizona Public Service Company, Magma Copper Company, Farmers Investment Company, Cyprus Minerals Company, Apache Powder Company, City of Phoenix, Salt River Project Agricultural Improvement and Power District and the Salt River Valley Users' Association are granted and denied.

FURTHER ORDERED: Cross-Petition of United States for Interlocutory Review [Cross-Petitioner Department of Justice]:

Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Gila Valley Irrigation District and Franklin Irrigation District]:

With respect to the issues in which it expressed "particular interest":

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 4 = Review is denied.

WC-90-0004-IR **IN THE MATTER OF THE RIGHTS TO THE USE OF THE GILA RIVER vs. ARIZONA PUBLIC SVC/MAGMA COPPER CO/FARMERS INVESTMENT CO**

ORDERED: Petition for an Order Allowing an Interlocutory Appeal and

Request for a Briefing Schedule [Petitioners Arizona Public Service Co/ Magma Copper Company/Farmers Investment Company]:

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 4; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects.

FURTHER ORDERED: Joinder in APS Petition for Review and Notice of Intent to File Response to Petitions for Interlocutory Review [Joint Petitioner Cyprus Minerals Company and Apache Powder Company]:

Review is granted and denied to the same extent as the petition of Arizona Public Service Company, Magma Copper Company, and Farmers Investment Company is granted and denied.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioner Church of Jesus Christ of Latter Day Saints]:

Review is granted and denied to the same extent that the petitions of City of Glendale, Roosevelt Water Conservation District, Arizona Public Service Company, Magma Copper Company, Farmers Investment Company, Cyprus Minerals Company, Apache Powder Company, City of Phoenix, Salt River

Project Agricultural Improvement and Power District and the Salt River Valley Users' Association are granted and denied.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Central Arizona Irrigation and Drainage District, Maricopa-Stanfield Irrigation & Drainage District and New Magma Irrigation & Drainage District]:

Review is granted and denied to the same extent as the petitions of Arizona Public Service Co., Magma Copper Co., Farmers Investment Co., Roosevelt Water Conservation District and the City of Glendale are granted and denied.

FURTHER ORDERED: Cross-Petition of United States for Interlocutory Review [Cross-Petitioner Department of Justice]:

Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Gila Valley Irrigation District and Franklin Irrigation District]:

With respect to the issues in which it expressed "particular interest":

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 4 = Review is denied.

WC-90-0005-IR **IN THE MATTER OF THE RIGHTS TO THE USE OF THE GILA RIVER vs. ROOSEVELT WATER CONSERVATION DISTRICT**

ORDRED: Roosevelt Water Conservation District's Petition for Interlocutory Review of Portions of Order of September 9, 1988:

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number [sic] 4 & 5; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 5; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioner Church of Jesus Christ of Latter Day Saints]:

Review is granted and denied to the same extent that the petitions of City of Glendale, Roosevelt Water Conservation District, Arizona Public Service Company, Magma Copper Company, Farmers Investment Company, Cyprus Minerals Company, Apache Powder Company, City of Phoenix, Salt River Project Agricultural Improvement and Power District and the Salt River Valley Users' Association are granted and denied.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Central Arizona Irrigation and Drainage District, Maricopa-Stanfield Irrigation & Drainage District and New Magma Irrigation & Drainage District]:

Review is granted and denied to the same extent as the petitions of Arizona Public Service Co., Magma Copper Co., Farmers Investment Co., Roosevelt Water Conservation District and the City of Glendale are granted and denied.

FURTHER ORDERED: Cross-Petition of United States for Interlocutory Review [Cross-Petitioner Department of Justice]:

Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Gila Valley Irrigation District and Franklin Irrigation District]:

With respect to the issues in which it expressed "particular interest":

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 4 = Review is denied.

WC-90-0006-IR **IN THE MATTER OF THE RIGHTS TO THE USE OF THE GILA RIVER vs. CITIES OF MESA, TEMPE, CHANDLER, AVONDALE AND CASA GRANDE**

ORDERED: Petition for Interlocutory Review [Petitioner Cities of Mesa, Tempe, Chandler, Avondale & Casa Grande]:

Issue Number 1 = Review is denied;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 6; review is denied in all other respects.

FURTHER ORDERED: Cross-Petition of United States for Interlocutory Review [Cross-Petitioner Department of Justice]:

Review is granted to the extent it addresses the Court's Issue Number 3; Review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Gila Valley Irrigation District and Franklin Irrigation District]:

With respect to the issues in which it expressed "particular interest":

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 4 = Review is denied.

WC-90-0007-IR **IN THE MATTER OF THE RIGHTS TO THE USE OF THE GILA RIVER vs. CITY OF GLENDALE**

ORDERED: City of Glendale's Petition for Review by Interlocutory Appeal of the Trial Court's September 9, 1988 Order [Petitioner City of Glendale]:

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 4; review is denied in all other respects;

Issue Number 2 = Review is denied;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioner Church of Jesus Christ of Latter Day Saints]:

Review is granted and denied to the same extent that the petitions of City of Glendale, Roosevelt Water Conservation District, Arizona Public Service Company, Magma Copper Company, Farmers Investment Company, Cyprus Minerals Company, Apache Powder Company, City of Phoenix, Salt River Project Agricultural Improvement and Power District and the Salt River Valley Users' Association are granted and denied.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Central Arizona Irrigation and Drainage District, Maricopa-Stanfield Irrigation & Drainage District and New Magma Irrigation & Drainage District]:

Review is granted and denied to the same extent as the petitions of Arizona Public Service Co., Magma Copper Co., Farmers Investment Co., Roosevelt Water Conservation District and the City of Glendale are granted and denied.

FURTHER ORDERED: Cross-Petition of United States for Interlocutory Review [Cross-Petitioner Department of Justice]:

Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects.

FURTHER ORDERED: Petition for Interlocutory Review [Joinder] [Petitioners Gila Valley Irrigation District and Franklin Irrigation District]:

With respect to the issues in which it expressed "particular interest":

Issue Number 1 = Review is granted to the extent it addresses the Court's Issue Number 2; review is denied in all other respects;

Issue Number 2 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 3 = Review is granted to the extent it addresses the Court's Issue Number 3; review is denied in all other respects;

Issue Number 4 = Review is denied.

DATED this 11th day of December, 1990.

/s/ Stanley G. Feldman
STANLEY G. FELDMAN,
VICE CHIEF JUSTICE

APPENDIX E

IN THE SUPREME COURT OF THE
STATE OF ARIZONA

IN RE THE GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN THE GILA RIVER SYSTEM AND SOURCE	Action No. WC-1, WC-2, WC-3 and WC-4 (consolidated) Maricopa County Superior Court Nos. W-1, W-2, W-3 and W-4 (consolidated) SPECIAL PROCEDURAL ORDER PROVIDING FOR INTERLOCUTORY APPEALS AND CERTIFICATIONS

Pursuant to Article 6, § 5 of the Arizona Constitution, A.R.S. §§ 45-259 and 12-2101, and Rule 19(a)(3) and (f), Arizona Rules of Civil Appellate Procedure, 17B A.R.S., the following procedure is adopted for interlocutory appeals and certifications arising from this general adjudication:

A. Scope

Any party to this general adjudication of water rights under A.R.S. § 45-251 *et seq.* may petition the Supreme Court to review by interlocutory appeal any ruling of the superior court. Also, the trial court may certify to the Supreme Court questions deemed substantial and properly the subject of interlocutory review or appeal under this rule.

B. Grounds

The decision whether to grant or deny a petition for interlocutory review or appeal or certification shall be discretionary. In the exercise of its discretion the Supreme Court may consider, without limitation, the following factors:

1. That the ruling of the superior court is in conflict with a ruling from another adjudication proceeding pursuant to A.R.S. § 45-251 *et seq.*;

2. That the ruling has decided an important question of law that should be decided by the Supreme Court before further proceedings or final judgment in the trial court;

3. That substantial savings of time, expense, or resources may be achieved through early appellate review;

4. That the interests of justice otherwise require early appellate review;

5. Those factors described in Rule 23(c)(4), Ariz.R.Civ.App.P., 17B A.R.S., or Rule 3, Ariz.R.P.Spec.Act., 17B A.R.S.

C. Time for Filing of Petition; Cross-Petition

A petition or certification seeking interlocutory review or appeal of a trial court ruling made prior to the effective date of this order shall be filed within one hundred fifty days after the effective date of this order. A petition or certification seeking interlocutory review or appeal of a trial court ruling made after the effective date

of this order shall be filed within ninety days after the trial court's ruling. For purposes of this rule, the date of the trial court's ruling shall be the date on which the last motion for reconsideration or request for amendment and/or alteration, however denominated, is finally resolved, providing such motion is filed within thirty days after the date the trial court first ruled on the question. A cross-petition for an interlocutory appeal may be filed within thirty days after service of a petition or certification.

D. Form and contents of petition, cross-petition or certification

To the extent possible, the petition, cross-petition or certification seeking interlocutory review or appeal shall comply in form and content with Rule 23(c), Ariz.R.Civ.App.P., 17B A.R.S. In addition, the petition or cross-petition shall contain a concise statement showing why the questions are ripe for interlocutory appeal.

E. Service

The petition, cross-petition or certification shall be served in the same manner as the superior court pleadings in this general adjudication, as follows:

1. A copy of the petition, cross-petition or certification shall be mailed to all parties listed on the trial court's approved mailing list pursuant to Pre-Trial Order No. 1. A copy of the current approved mailing list shall accompany the petition. In addition, a copy of the petition, cross-petition or certification shall be filed in this

general adjudication proceeding. A copy of the petition, cross-petition or certification shall be served on the judge or master who made the ruling in question and on the Arizona Department of Water Resources.

2. The Arizona Department of Water Resources shall promptly serve a copy of the petition, cross-petition or certification on the judge or master and clerk of any other superior court in which a general adjudication is pending, who shall then give appropriate notice of the pendency of such petition to the parties to that adjudication.

F. Response

Within forty-five (45) days after service of a petition, cross-petition or certification, any party to the trial court proceeding may file a response, which shall comply in form and content with section (D) of this order and be served in the same manner as the petition, cross-petition or certification. Parties to other pending general adjudication [sic] desiring to participate in an interlocutory appeal shall file a motion for leave to intervene within forty-five (45) days after service of the petition pursuant to subsection (E)(2).

G. Reply

Any party to the proceeding below may reply to any response within thirty (30) days after service thereof. A reply shall be served in the same manner as a petition.

H. Order on petition; service

1. This court may issue its order on the petition, cross-petition, or certification without oral argument. The order shall grant or deny review by interlocutory appeal and specifically list those questions, if any, granted. An order denying a petition or certification or any part thereof shall not have any precedential value.

2. The order granting or denying interlocutory appeal shall be served by the Clerk of the Supreme Court on the trial judge, the master, the petitioner, the cross-petitioner, if any, and all persons listed on the service list accompanying the petition, and shall be filed of record by the Clerk of the Superior Court.

3. An order granting review by interlocutory appeal shall also schedule a pre-submittal conference not sooner than sixty (60) days after the service of the order, as provided below.

4. The Supreme Court may, on its own motion or on motion of the parties, consolidate one or more petitions, cross-petitions, or certifications from the same or different general adjudication proceedings for any or all purposes.

I. Pre-submittal conference

No later than twenty (20) days prior to the scheduled presubmittal conference, each party desiring to participate in the interlocutory appeal shall file a notice of appearance in the Supreme Court. The trial court shall not be deemed a party to the appeal, nor shall it participate in the appeal in any respect, even if the appeal is

based on its certification. The Supreme Court may designate the parties as appropriate and, in the case of a certification, may align the parties in accord with their true interest in the questions presented. At the presubmittal conference, the Supreme Court shall make orders regarding further briefing and oral argument, if any. It shall also determine what portion of the record will be required to be transmitted, the date of transmittal, the parties to join in the presentation of issues, and other appropriate matters.

J. Standard of review

The standard of review to be applied to any interlocutory appeal under this rule shall be the same standard that would apply had the review been made following a final judgment in the adjudication proceeding.

K. Costs and attorneys' fees

Unless provided by statute, there shall be no application for costs or attorneys' fees made to the Supreme Court in connection with a petition for review by interlocutory appeal or with an interlocutory appeal granted under this rule. However, Rule 25, Ariz.R.Civ.App.P., 17B A.R.S., is fully applicable to pleadings filed pursuant to this order. All other issues of costs and attorneys' fees, if any, shall abide the final resolution of the adjudication.

L. Other procedures

1. Except as otherwise provided herein, the Arizona Rules of Civil Appellate Procedure shall apply to proceedings under this order. Insofar as may be necessary, the provisions of Rule 5, Ariz.R.P.Spec.Act., 17B A.R.S., concerning stays, *ex parte* orders, restraining orders, and injunctions shall also apply.

2. This order is the exclusive remedy for the presentation of interlocutory issues to this court in this adjudication, including those issues that otherwise might be presented pursuant to the Rules of Procedure for Special Actions.

M. Priority

Insofar as possible, matters in this general adjudication shall be determined in preference to other civil matters.

N. Filing date and extension of time periods

All pleadings in any proceeding under this order shall be deemed filed on the day of mailing if deposited in a United States Post Office or mailbox, addressed to the Clerk of the Supreme Court, within the time allowed for filing. The Court, on its own motion, or by motion of a party with good cause shown, may grant extensions of any of the time limits set out in this order.

COMMENTS

Purpose. The purpose of this order is to establish a procedure for early review of all substantial questions in this general adjudication of water rights. Early appellate review may avoid wasteful trial court proceedings, may result in substantial savings of time or expense, or may for other reasons be in the interests of justice. The rule is not intended to be used for interlocutory appeal of individualized matters except where such an appeal might result in a ruling of general application that would advance the adjudication process.

Need. Existing procedure allows interlocutory considerations of trial court rulings in certain limited circumstances. Thus, A.R.S. § 12-2101 describes the appellate jurisdiction of the Arizona Court of Appeals with respect to final judgments and certain interlocutory orders. Rule 54, Ariz.R.Civ.P., 16 A.R.S., provides a certification procedure for making certain judgments final that would not otherwise be appealable. The Rules of Procedure for Special Actions permit discretionary review of interlocutory decisions where the decision is arbitrary, capricious, or an abuse of discretion, or where the trial court may be proceeding without, or in excess of, jurisdiction. None of these procedures, however, provides for discretionary appellate jurisdiction of the Supreme Court other than in these limited circumstances.

A general adjudication of water rights filed pursuant to A.R.S. § 45-251 *et seq.* is a lengthy proceeding that requires investment of vast public and private resources. There is a need to provide for discretionary appellate review of interlocutory decisions of the trial court in this

proceeding to avoid the waste that might otherwise occur if significant interlocutory decisions were only reviewable after final judgment, which might not be entered for several years.

Jurisdiction and authority. Article 6, § 5 of the Arizona Constitution provides that the Supreme Court shall have:

> 3. Appellate jurisdiction in all actions and proceedings except civil and criminal actions originating in courts not of record, unless the action involves the validity of a tax impost, assessment, toll, statute or municipal ordinance.
>
> * * *
>
> 5. Power to make rules relative to all procedural matters in any court.

Rule 19, Arizona Rules of Civil Appellate Procedure, 17B A.R.S., authorizes the Supreme Court to transfer appeals from the Appeals Court on its own motion. The adoption of this special procedural order will effectively transfer all interlocutory appeals under this order to the Supreme Court pursuant to Rule 19(f).

Service. Subsection (D) of the order provides for service of the petition on parties to the adjudication in the same manner as other pleadings are served. In addition, filing the pleading of record in the superior court proceedings will cause the petition to be listed in the clerk's docket summary, which is mailed monthly to subscribers and which is available in the clerk's office for review by any party.

Response/cross-petition. The response provides a party with the opportunity to support the petition or set

forth the reasons why the petitions should not be granted. The response may also seek to narrow the scope of the interlocutory appeal if granted or to reformulate the matter for which interlocutory appeal is sought. The cross-petition may seek to have the court grant an interlocutory appeal of additional related questions if the petition or certification is granted. The cross-petition should make the same showing as required for the petition itself.

Order denying petition. Unless stated to the contrary, an order denying a petition, cross-petition or certification is not intended to indicate that the Supreme Court approves of the trial court's ruling, but only that the Supreme Court has determined that there is an insufficient basis on which to grant review by interlocutory appeal. A subsequent petition, cross-petition or certification seeking interlocutory review or appeal of a ruling for which a previous petition has been denied may be entertained by the court, but only on a showing of a change of circumstances or additional grounds which could not, in the exercise of reasonable diligence, have been known at the time of the previous petition, cross-petition or certification.

Stay. The granting of a petition for an interlocutory appeal shall not stay the proceedings in the superior court unless expressly so ordered by the Supreme Court.

Dated this 26th day of September, 1989.

/s/ Stanley G. Feldman
STANLEY G. FELDMAN,
VICE CHIEF JUSTICE

[Mailing List Omitted]

APPENDIX F

IN THE SUPERIOR COURT OF THE
STATE OF ARIZONA

IN AND FOR THE COUNTY OF MARICOPA

IN THE GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN THE GILA RIVER SYSTEM AND SOURCE	W-1 (Salt) W-2 (Verde) W-3 (Upper Gila) W-4 (San Pedro) ORDER

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Introduction

On May 20, 1988 this Court heard argument on the motion of various city claimants to exclude from the adjudication all wells which are pumping "percolating groundwater" and to include in this adjudication only "surface flow" and "sub surface flow" as defined by *Maricopa County Municipal Water Conservation District No. 1 v. Southwest Cotton*, 39 Ariz. 65, 4 P.2d 369 (1931). That motion, filed November 17, 1987, was the result of many discussions herein relating to the relationship between surface water and ground water and how these different sources of water interface and affect each other. This has been an on-going matter of consequence and it resulted, after request of counsel, in five days of hearings on the general subject. From October 19, to 23, of 1987, the court heard the testimony of a number of leading hydrologists and hydrological engineers, including Leonard Halpenny, Thomas M. Stetson, Catherine Kroeger Rovey, William Gookin and William Guyton, as well as others also well qualified. They testified as to groundwater and surface water relationships. Each filed voluminous reports which were received in evidence. These covered the general relationship of ground and surface water and specifically

its relationship in the San Pedro and Santa Cruz watersheds.

Because the issue covered by that five day hearing and the cities [sic] motion fell within the purview of the issues which the court believed were appropriate for determination under section 10 "Issue Identification and Resolution" of Pre-Trial Order No. 1 dated May 29, 1986, this Court, with counsels [sic] concurrence, decided to use the cities' motion as a vehicle to identify and resolve a number of important and sensitive surface water and ground water issues. The matter was discussed at our 11/20/87 hearing in the following terms.

> A discussion is opened by the Court on the decision which the court must make on the Ground water [sic] and Surface Water "Interrelationship" which was the subject of the October 19th to 23rd, 1987 hearing. The Court then brought up the motion filed by numerous cities to exclude ground water from this adjudication. The Court advises it believes it appropriate to expand the cities' motion to the entire issue of the Ground Water and Surface Water Relationship, including whether or not the "Winters Doctrine" applies to ground water. It is agreed that all parties may submit a list of what issues should be included in the determination to be made, provided that no list shall exceed ten pages. The list shall also be submitted no later than 5:00 p.m. on December 8, 1987.
>
> The Court will take up the scope of issues to be considered at its December 17, 1987 hearing. Upon its determination of the issues to be considered, all parties shall have 60 days to brief the same and 30 days thereafter to respond to

> the others' briefs submitted. D.W.R. is specifically ordered to brief the issues ordered and respond, particularly with regards to the matters of what legal authority this Court has in this jurisdiction to act, in what ways different decisions would impact D.W.R.'s ability to provide accurate and correct information and effects upon administration of any decree arrived upon, as well as what other issues D.W.R. as this Court's technical and administrative adviser D.W.R. believes must be considered for his adjudicative process to be meaningful. Minute Entry Order 11/20/87, page 4.

On 12/17/87 the court and counsel discussed the submissions filed and the Court advised it would then decide what those issues would be. On 1/19/88 this Court issued the following orders.

> Pursuant to this Court's order at its November 20, 1987 hearing and the hearing on December 17, 1987, this Court has received the filed lists of issues which a number of parties submitted which they believe should be included in the question of the Ground Water and Surface Water relationship, all as raised by the Motion for Summary Judgment filed by a number of cities to exclude ground water from this adjudication. The Court has also considered the comments made by counsel at our hearing on December 17, 1987. As the Court said then, it has found in many of the lists submitted similar issues raised and in some there was submitted question [sic] of such complexity that a substantial factual hearing would be needed to provide a data base from which to start answering such questions. Such submitted issues have been discarded.

However, after attempting to distill all submissions to issues which can be decided as matters of law and after considering the evidence taken at our hearing on the issue from October 19 to the 23rd, 1987, the Court finds that in addition to the issues raised in the cities' motion, the Court will consider the following issues which it believes are related to the ground water relationship issues of this case.

1. Is ground water included within the phrase "river system and source" as it is used in A.R.S. §§ 45-141 and 45-251(B), and if so, to what extent is it included?

2. Is ground water included within the phrase "water subject to claims based on federal law" as it is used in A.R.S. § 45-251?

3. Assuming that percolating ground water is not included in the definitions of A.R.S. § 45-141 and 45-251(B), does a McCarran Amendment Adjudication require that percolating ground water be included and if so, how can this be done under Arizona law?

4. If the answer to Issue No. 3 is in the affirmative, does the adjudication have to include only claims under federal law or must state law claims as to percolating ground water also have to be included?

5. If the answer to Issue No. 3 is in the affirmative, does the adjudicatory process extend to a determination of rights to percolating ground water which is normally in this state subject to a "reasonable use" standard to the same extent as it does to surface water which normally is subject to "prior appropriation" standard?

6. Does the "Winters" Doctrine of Federal Reserved Rights apply to percolating ground water under and/or outside of a federal reservation, how does it apply and does it apply only to the reduction of surface water resources and/or ground water resources beneath the federal reservation?

7. If percolating ground water in the watershed of the Gila River System is subject to the jurisdiction of this adjudication, what is the affect of the Ground Water Management Act of 1980?

8. Are there technical and/or procedural problems in determining, prioritizing and/or apportioning ground water rights which present problems of such magnitude in the reliability of the data for such a determination that an attempt to prioritize ground water could violate due process requirements? Minute Entry Order dated 1/19/88.

Between 1/29/88 and 5/20/88 this Court received several hundred pages of briefs from many claimants consisting of responses to the cities' 41 page motion, replies to those responses, and finally a reply of the cities to all those responses and replies. In the meantime the Court did have the benefit of a very substantial soon to be published law review article by Professor of Law John D. Leshy of Arizona State University entitled "Arizona Law Where Ground and Surface Water Meet."

It is the issues above delineated and the issues of the cities' motion which were briefed, argued and which this court will attempt to deal with in this order.

Is the Process of Issue Identification and Resolution Followed Here and Throughout This Case Appropriate

As is readily apparent from a reading of the prior section of this order the process being followed here of early issue identification and resolution is neither a traditional nor ordinary method of resolution of legal issues in litigation. This fact has been brought to the court's attention on several occasions by claimants who suggest such issue resolution should await the evidentiary hearings in each watershed. They argue only after all facts are known should such decisions be made. Unfortunately, this adjudication is not traditional litigation or even a traditional complex litigation of multiple parties. Even in that type of case, with many parties, there are generally two, three, four or five sides and the parties line up behind one or another of the sides. In this case there are thousands of claimants, all of whose claims relate to and opposes [sic] all other claims. There is a finite amount of water available. Each claimant's right takes from the possible rights, amount and/or priority of every other claimant. While it is apparent that many of the claimants are in alliance on certain issues, in fact each claimant is adverse to every other claimant no matter whether their property lies in the upper reaches of the Salt or the lower reaches of the Gila.

Making this even more complicated is the fact that the adjudication process of A.R.S. §§ 45-251 to 45-260 provides each claimant shall file a complicated Statement of Claimant and there after [sic] the Department of Water Resources (D.W.R.) shall issue a certain Hydrographic Survey Report (H.S.R.) for each watershed. These reports are the foundational basis from which the master will

determine his report of the rights and priority of the various claimants. Each claimant has a right to object to those reports, and an opportunity to present evidence to support his individual claim, (see A.R.S. §§ 45-254, 256 and 257) but D.W.R.'s H.S.R. is still the foundation of the process. Finally this process has been approved by the Arizona Supreme Court in *U.S. v. Superior Court*, 144 Ariz. 265, 697 P.2d 658 (1985).

For the Department of Water Resources, this has been a long, on-going, expensive and labor intensive process. It requires a high degree of cooperation and advice from the Court as to what it should investigate, how it should report, and what it is that it should be dealing with. The budget for this process exceeds a million dollars per year and it is essential that if this money is to be wisely spent and not wasted, many of these issues need to be resolved before the report is made. In many instances DWR needs instruction as to how they should investigate and report. Often D.W.R.'s questions are the very ones considered in this issue identification and resolution process. If this is not done first, D.W.R. and its personnel will waste money, manpower and effort on matters which will be meaningless, issues will have to be restudied, but most of all the process significantly delayed because the report focused on the wrong issues, facts or rights.

Delay may be of benefit to some claimants, particularly those who already have and are using the water. For those who claim "reserved rights" and do not presently have actual use of the water, unnecessary delay is an unconscionable additional burden.

It is evident this adjudication will be a long process, but it need not be made longer simply to satisfy the ordinary and traditional method of "one on one" litigation. This case is very unique. A.R.S. §§ 45-251 et. [sic] seq. Our Supreme Court recognized this is in *U.S. v. Superior Court, supra.* It also recognized its uniqueness in its latest order of March 3, 1988 which says:

> Further construing the terms of Rule 53(a), the Court does not believe it necessary that every factual issue in this case be decided in a traditional courtroom proceeding. Much of the factual evidence in this case may well be gleaned from documents, historical records, archaeological data and the like. The parameters of the trial judge's evidentiary discretion in this case are considerable.

Finally the court points out that what it has done here is consistent with the process outlined in its Pre-Trial Order #1, article 10.

For all of those reasons this Court overrules any objections to the process being followed.

Is the Jurisdiction of this Case Determined by the McCarran Amendment or by Arizona Statutes

An appropriate place to start the discussion of the issues here involved is whether the jurisdiction of this case is determined by the McCarran Amendment, 43 U.S.C. [sic] 666, or by Arizona statutes A.R.S. §§ 45-141 and 45-251(B). To a large extent this issue is a microcosm of the larger issue to be determined here. On one hand

the federal claimants and Indian tribes claim the adjudication must include all water, surface and ground, which is hydrologically connected, no matter how slight the connection to meet some test of "Comprehensiveness" which they claim a "McCarran Act" adjudication requires. On the other hand, many if not all of the state right claimants want the adjudication limited to surface water appropriable under A.R.S. § 45-141 (surface and sub surface flow) and "water rights subject to claim based on federal law" under A.R.S. § 45-251, which they define as reserved rights derived from *Winters v. United States*, 207 U.S. 564, 28 S. Ct [sic] 207, 52 L. Ed. 340 (1908). The extent of this conflict is probably best illustrated by the claim of the United States that this Court must prioritize and apportion all ground water rights in the state, whether related to a federal reserved water right or not. This they claim in spite of the long held Arizona rule that ground water is not "appropriable" and such "appropriability" sets the limits of this adjudication's jurisdiction as to state right claimants under A.R.S. § 45-141.

Fortunately for this case, the argument has no merit.

1. The McCarran act [sic] is an act of procedural context which waives the sovereign immunity of the United States, its agencies and those Indian tribes which are subject to trust status.

2. The McCarran Act does not confer or define the jurisdiction of the adjudicating court and confers no substantive rights on the adjudicating court or change the water law of the state in which the adjudication occurs.

3. Each state can define its own process for the adjudication as long as it meets the McCarran Act

guidelines. If that process meets those guidelines then the waiver of sovereign immunity applies.

4. The jurisdiction of this court for this adjudication is provided by A.R.S. §§ 45-141 and 45-251. It consists of that "river system and source" which is appropriable under A.R.S. § 45-141 and "all water subject to claims based upon federal law." A.R.S. § 45-251.4.

It is clear that percolating ground water in this state is not subject to appropriation. *M.C.M.W.D. No. 1 v. S. W. Cotton,* supra and *Bristor v. Cheatham,* 75 Ariz. 227, 255 P.2d 173 (1953). There is not a "comprehensiveness" requirement in the McCarran Act that makes it otherwise. Not one of the cases cited by the United States in its memoranda for that "proposition" supports their theory. Most clearly conflict with it. Those cases are *Dugan v. Rank,* 372 U.S. 609, 83 S.Ct. 999, 10 L.Ed2d [sic] 15 (1963); *United States v. District Court,* 401 U.S. 520, 91 S.Ct. 998, 28 L.Ed.2d 278 (1971); *Colorado River Water Conservation District v. United States* 424 U.S. 800, 96 S.Ct. 1236, 47 L.Ed.2d 483 (1976); *California v. United States,* 438 U.S. 645, 98 S.Ct. 2985, 97 L.Ed.2d 1018 (1978); *United States v. Bluewater Toltec Irrigation District,* 580 F. Supp [sic] 1434, 1446 (1984); and *Matter of Determination of Conflicting Rights,* 484 F. Supp [sic] 778, 783, 784 (D.Ariz. 1980). Each one of these cases flies in the face of the comprehensiveness theory that the United States suggests. In each one of them there was a significant degree of non-comprehensiveness. There is not a single case which supports the comprehensiveness theory the United States claim [sic]. This theory is an unwarranted extension of an attempt to foster federal claims. Even in a recent case cited by the United States for its position, *Idaho ex rel Higginson v.*

Unites [sic] *States*, No. 39576 (Idaho District Ct., Twin Falls County, Oct. 14, 1987) the Department of Justice argued exactly the opposite. This was in the Snake River adjudication. While it is true Judge Hurlbutt ruled to include state groundwater users in the adjudication, it was because his statute, Idaho Code § 42-1406(A) (Supp 1987) specifically made "all users of surface and ground water" on the Snake river [sic] system subject to the adjudication. A.R.S. §§ 45-141 and 253 are to the contrary. They retain Arizona's long held concept that it is only appropriable water (surface and subsurface flow) which is subject to the adjudication where the right claimed is under state rights.

Based on all of the above this court finds its jurisdiction is limited by and defined by A.R.S. §§ 45-141 and 45-251 and is neither enlarged by or restricted by 43 U.S.C. [sic] 666.

Agreements by Counsel as to What Should Be Included Which May Not be Clearly Within Parameters of A.R.S. §§ 45-141 and 45-251

The cities' motion of 11/17/87 started out claiming that all wells pumping "percolating ground water" should be excluded from the case. However, by the time of the argument on 5/20/87 every one [sic] through the evolutionary process of briefing and argument had come to agree with the position of Thomas M. Stetson who on 10/20/87 in describing a similar adjudication in the San Gabriel River Watershed of California recommended that all wells be included and cataloged at least for location, date of drilling, first use, historical data, and amount of

water even if the jurisdictional limits of the case did not require a determination of their priority and entitlement. Inclusion in the judgment of the data base of all the wells for those purposes appears to be commonly agreed upon and accepted by many who argued on 5/20/88. It was opposed by none. The Department of Water Resources will be so ordered to include the same in its reports and they will be so recognized in any judgment arrived at, even if their source does not fall in the area of water which is appropriable or subject to federal claims.

Secondly, the proponent of the cities' motion and several other counsel agreed in argument that because of the cases *M.C.W.C.D No. 1 v. Southwest Cotton,* supra and *Pima Farms v. Proctor,* 30 Ariz. 96, 245 P. 369 (1926), the court must include in appropriable water not only the surface flow of a stream but also the sub-surface flow which supports and is connected to the surface flow. This is so even though the *Southwest Cotton* case defines this sub-flow in a more limited fashion than the *Pima Farms* case, using the following terms.

> The best test which can be applied to determine whether underground waters are as a matter of fact and law part of the surface stream is that there cannot be any abstracting of the water of the underflow without abstracting, a corresponding amount from the surface stream,
>
> * * *
>
> Does drawing of the subsurface water tend to diminish appreciably and directly the flow of the surface stream?
>
> (39 Ariz. at 96 and 97)

Still, where to factually draw the line on the ground remains a significant problem. The point most counsel accept, though some go further, is the suggestion of hydrologist Leonard Halpenny, that at least those wells which withdraw water from the "younger alluvium" of the tributary streams' basin should be presumed to be pumping sub-flow. The Court will accept that and will instruct D.W.R. in its reports to investigate such and treat such wells as pumping appropriable stream flow provided that the investigation shows:

1. As to wells located in or close to that younger alluvium, the volume of stream depletion would reach 50% or more of the total volume pumped during one growing season for agricultural wells or during a typical cycle of pumpage for industrial, municipal, mining, or other uses, assuming in all instances and for all types of use that the period of withdrawal is equivalent to 90 days of continuous pumping for purposes of technical calculation.

2. A well is designated on state records as an in lieu well [sic]

3. A well is designated by state certification as pumping surface flow, such as the wells for Pima Farms.

While it may appear the above instructions are somewhat arbitrary, they are basically for use in instructing D.W.R. in the preparation of its H.S.R. It certainly shall not preclude any owner of such a well, at the time of the evidentiary hearing, from coming in and showing that the well is not pumping sub-flow, regardless of the location of the source of that well.

The Limits of Jurisdiction as to the Adjudication of Those Claims of Water Rights Under State Law

By this point, it should be obvious that the limits of jurisdiction of this adjudication are the limits of the two types of claims to be included. These are the claims of those being made under a state right appropriation and under reserved rights which are derived because the land is federally owned or federally intrusted. In this section of the order the Court will discuss the state right appropriations.

Under A.R.S. § 45-252 any water user of a river system or source may petition for an adjudication of "the nature, extent and relative priority of the water rights of all persons in the river system and source." It is the definition of what the "river system and source" is which sets the limits or jurisdiction of this adjudication. In A.R.S. § 45-251.4 the first category is "all water appropriable under § 45-141." A.R.S. § 45-141.A reads as follows.

> A. The water of all sources flowing in streams [sic] canyons, ravines or other natural channels, or in definite underground channels, whether perennial or intermittent, flood, waste or surplus water, and of lakes, ponds and springs on the surface, belong to the public and are subject to appropriation and beneficial use as provided in this chapter.

Therefore, the first and largest category of sources of water supply subject to this adjudication, and necessarily the largest is the segment of the water supply already appropriated and in use, surface flow. This includes by way of illustration the surface flow of the Salt, Verde, Gila, Agua Fria, Black, and other rivers or streams.

Second, we have the sub-flows of these rivers as such sub flow [sic] is defined by the *Southwest Cotton* case and those which follow it. No matter what one may suggest about the present day technical accuracy of Justice Lockwood's 1931 decision in *Southwest Cotton*, it has been the law in this state for more than 50 years and accurately reflects what the law was for the fifty years prior to its decision.

Having decided that under claims based on state law this court has jurisdiction only to determine the "nature, extent, and relative priority" of surface and sub surface flow, the Court believes it should also define what it may not consider under state law, because later on it must consider whether that rule remains the same for claims under federal law.

As of the Gadsen [sic] Purchase in 1853, water rights in this state were as set forth on page 75 of 39 Ariz. Reports in the [sic] *Southwest Cotton*. By case and statute, Arizona long ago decided that only surface water and stream flow are appropriable. As to percolating groundwater, there was no right of appropriation. Since territorial days, Arizona law has been that a user of percolating ground water had a right to remove such water anytime for any reasonable use as long as it was put to that use on the land from which it was withdrawn. This was permissible without reference to its effect on his neighbor's static water level, effect on his neighbor's ability to withdraw groundwater from his well or it's [sic] effect on his neighbor's upstream or downstream surface flow level, *Bristor v. Cheatham, supra, England v. Ally Ong Hing*, 8 Ariz. App. 374, 446 P.2d 480, [sic] (1968) 8 Ariz. App. 558, 448 P.2d 128 (1969); *Bull v. Siegrist*, 169 Or. 180, 126 P.2d 832 (1942); *Jarvis v. State Land Department*, 104

Ariz. 527, 456 6 [sic] P.2d 385 (1969); 106 Ariz [sic] 506, 479 P.2d 169 (1970); 113 Ariz [sic] 230, 550 P.2d 227 (1976); *Farmers Investment Co. v. Bettwey*, 113 Ariz [sic] 520, 558 P.2d 14 (1976). Except for the provisions of the Groundwater Management Act, A.R.S. §§ 45-401 through 45-655, that is still the law in this state today.

A *caveat* needs to be inserted here, for the Groundwater Management Act has created significant changes in the right to withdraw and use such groundwater in those areas designated by the law as Active Management Areas (A.M.A.s) and Irrigation Nonexpansion Areas (I.N.A.s). Those changes need not be gone into here except to state that in those areas the right to basically withdraw and use percolating groundwater has gone from what could formerly be annalogized [sic] to a limited form of "riparian" right to a much more restricted "appropriative" right. Finally it should be noted that the enactment of that act also has the effect to cause our Supreme Court to recognize in *Town of Chino Valley v. City of Prescott*, 131 Ariz. 78, 638 P.2d 1324 (1981), appeal dismissed 457, [sic] U.S. 1101 (1982), rehearing denied 459 U.S. 899 (1982), that the owner of the overlying surface had no *right* to withdraw the water beneath his lands for reasonable use until that right came into being by the actual withdrawal and then, and only then, that right was only for the limited purpose of using the water.

> We therefore hold that there is no right of ownership of groundwater in Arizona prior to its capture and withdrawal from the common supply and that right of the owner of the overlying land is simply to the usufruct of the water.
>
> (131 Ariz. at 82)

Further the Arizona Supreme Court recognized that the right to make such a withdrawal was subject to legislative control, to wit: the Groundwater Management Act. See also *Cherry v. Steiner*, 543 F.Supp. 1270 (D. A. 1982).

Having said all of the above, a further *caveat* needs be inserted as it will lead to the next section of this order, to wit: a discussion of claims based on federal law or federal reserved water rights. Arizona by its statutes, constitution and case law from 1865 on, had an ability to affect only those water rights derived under Arizona law. It could not by enactments such as the Groundwater Management Act or its long line of decisions on the subject or otherwise affect the reserved water rights to surface water or groundwater of federally owned or federally entrusted lands such as Indian reservations.

Claims under [sic] Federal Law or What Reserved Rights Do Federal Lands or Federal Entrusted Land Have When There Has Been, as of this Date, No Physical Appropriation or Use

There are basically three different kinds of federal lands involved in this case. *First*, there is federally owned land as to which there is no federal statutory purpose or dedication to its use. As to such non-dedicated land, it has no greater rights to water use than any other neighboring private or state owned lands. There is no federal reserved right which attaches. There really is no issue in this case as to these lands.

Second, there are those federal lands which have a dedicated statutory purpose, such as national forests, parks, monuments, air fields, military establishments, etc.

All of these have federal reserved rights, whether in actual use or not, whose priority goes back to the date of the statutory enactment of the properties [sic] purpose. *United States v. New Mexico*, 438 U.S. 696, 98 S.Ct. 3012, 57 L.Ed2d. [sic] 1052 (1978).

Third, there are the federally entrusted lands, basically Indian reservations which also have federal reserved rights, whether in actual use or not, whose priority goes back to the date of the establishment of the reservation either by treaty, statutory enactment, or executive order.

While the above is a minimum picture of the rights involved, it is significantly more complicated and to a large extent somewhat undecided by the federal courts whose decisions bear on the subject. In the most recent decision on point, *In re Water of Hallet Creek Stream System*, 749 P.2d 324 (Cal. 1988) the Supreme Court of California indicated all federal lands start off with exactly the same rights to water as their neighboring private lands, plus they have such additional federal rights as accrue to that land by reason of its dedicated federal purpose. Their reserved water right is determined by federal case law or federal statute, except where that statute or case law chooses to apply the law of the state where the land is located.

Under the case of *United States v. New Mexico, supra*, all dedicated federal land has reserved to it that minimum amount of water which is necessary to effectuate the primary purpose of the land set aside. As to all secondary purposes there is no reserved right to water

and the United States can acquire water for that secondary purpose only in the same manner as any other user in the state.

The rule is a little different for entrusted lands, Indian reservations. Starting with the case of *Winters v. United States*, supra in 1908 and continuing through *Arizona v. California*, 373 U.S. 546, 83 S.Ct. 1468, 10 L.Ed.2d 542 (1963) and *Arizona v. California*, 460 U.S. 605, 103 S.Ct. 1382 [sic] 75 L.Ed.2d 318 (1983) the federal courts have continually held that each Indian reservation has reserved to it such water as is necessary to effectuate the purpose of that reservation. While as to other types of federal lands courts have allowed controversy about what the purpose of the land is and how much water will satisfy that purpose, as to Indian reservations the courts have drawn a clear and distinct line. It is that the amount is measured by the amount of water necessary to irrigate all of the *practicably irrigable acreage* (P.I.A.) on that reservation. In the opinion of this Court, the United States Supreme Court has drawn such a clear and distinct line for Indian reservations for fear that in cases such as this, they could be drawn into a potential racial controversy where some water user claims the reservations [sic] purpose was that of a "prisoner of war" camp where the "cavalry" intended to secure "wild marauders" from the surrounding "peaceful settlers", and how much water does a P.O.W. camp need?

In every decided case which has dealt with the subject, the amount of available water on or near the reservation was close to or enough to satisfy all the needs of the reservation and surrounding lands. That is not true in our desert environment.

While there is no case saying so, rationality must require another limiting factor in cases such as ours. With regard to federal reserved right claimants, including Indian reservations in limited water or desert environments, there must be the limiting factor of the amount of water from all sources available on or near the reservation on or about the date of the dedication of the land's purpose. The water to satisfy the federal purpose or practicably irrigable acreage cannot exceed that amount.

A major issue of nearly every brief filed for this hearing and the cities' motion, with the exception of the federal and Indian claimants, was the argument that if there was a federal reserved right to water, that right was limited only to "surface water". The claim is that there is no federal reserved right to ground water. In support of this proposition, every claimant except the federal and Indian claimants cite *Cappaert v. United States*, 426 U.S. 128, 96 S.Ct. 2062, 48 L.Ed.2d 523 (1978)[.] On the other side, every federal and Indian claimant cites the prior Ninth Circuit decision holding that there is a reserved right to ground water. While that decision was vacated, its result was affirmed. See 508 Fed [sic] 313 (1974). Interestingly, on this issue the Supreme Court decision has some very note worthy [sic] things to say.

> The implied-reservation-of-water-rights-doctrine, however, reserves only that amount of water necessary to fulfill the purpose of the reservation, no more.
>
> * * *
>
> No cases of this court have applied the doctrine of implied reservation of water rights to groundwater. Nevada argues that the implied

> reservation doctrine is limited to surface water. Here, however, the water in the pool is surface water. The federal water rights were being depleted because, as the evidence showed, the "[g]roundwater and surface water are physically interrelated as integral parts of the hydrologic cycle."
>
> * * *
>
> Thus, since the implied-reservation-of-water-rights doctrine is based on the necessity of water for the purpose of the federal reservation, we hold that the United States can protect its water from subsequent diversion, whether the diversion is of surface or groundwater.
>
> (426 U.S. at 141-143)

There are two ways one can interpret this decision, but both lead to the same conclusion. *First*, the implied reservation theory applies only to surface water, but since all surface water is interconnected to sources of groundwater, the right holder can prevent groundwater withdrawals that will decrease the amount of surface water available to fulfill the federally dedicated purpose. If you protect the groundwater pool to preserve the surface water flow, in effect you preserve the groundwater pool beneath the federal land available for withdrawal by federal right holders. *Second*, that the United States Supreme Court doesn't care where the water comes from, as long as sufficient sources remain to fulfill that property's purpose on a priority basis. Both theories work to preclude groundwater diversion which reduces water sources on the reservation, regardless of whether or not the diversion is on or off the reservation. In this Court's opinion, the second theory is more logical, reasonable

and in line with scientific theories of the integrated hydrologic cycle. This Court finds that federal reserved water rights apply to both surface water and groundwater sources on and off the reservation whose diversion affects reservation sources, to the extent that there is not enough water left to satisfy the reservation's purpose, or P.I.A. if the land is an Indian reservation.

Next, moving into an area in which there is no direct case or statutory authority in point, this Court believes that the doctrine enunciated in *United States v. New Mexico*, supra requires that the Court structure any judgment and its enforcement so that the impact of the use of federal reserved rights is minimized upon those whose state rights will be diminished and who had no "fault" in utilizing "water" which will now be used to fulfill Indian and federal reserved rights. In its power to mitigate loss and damages, a court has the power and should structure any judgment so that the actual taking and use of this federal reserved right is done in a manner which will minimize its effect on other users while still providing a source to meet the quantity needed. For example, a court, after taking evidence to provide a basis therefore, could apportion the federal reserved right between surface and groundwater in such a way that the quantity needed is fulfilled but the damage or loss to other users is minimized.

This is allowable because no decision has ever indicated that the source of the water is important, as long as the need is fulfilled. Also in support of this theory, it is worth noting the United States Supreme Court has also often stated that with regard to water law, to the extent

state water law can be followed without the diminishment of those rights which federal law seeks to protect, the federal court should allow state law to remain in effect.

While Arizona courts in *Southwest Cotton, supra,* and later cases have indicated that a surface water user has no right to sue or enjoin an upstream groundwater user whose reasonable use affects the flow of downstream groundwater, those rulings are not binding on the United States in its proprietary or trust capacity as to reserved surface water rights. Federal reserved surface water rights are subject to federal case law. That case law established in *Cappaert v. United States, supra* preserves federal surface water availability within such time frame as would affect the federal government's ability to carry out the primary purpose given the establishment of the federal reservation.

There is no question and the testimony in [sic] October, 1987 hearing clearly showed that to allow unlimited downstream groundwater pumping, even for a reasonable or beneficial use on the land above where the groundwater source is located, will and has significantly diminished the flow of many of Arizona's perennial and intermittent streams, including the Santa Cruz and the San Pedro Rivers. If this is allowed to continue, this can and will destroy or significantly diminish federal and tribal reserved rights to those streams where they have reserved surface flow rights.

To protect those reserved federal surface flow rights it is essential that downstream pumping which significantly diminishes those rights be located, prioritized and

the amount of diminishment established to provide a basis for later enforcement of whatever priority of reserved federal rights there is. The fact that under Arizona case law, surface flow appropriators have no right to protection against upstream groundwater pumpers does not diminish the right of holders of federal reserved surface water rights from protection against such diminishment under *Cappaert v. United States, supra.* This Court's jurisdiction under our adjudication statues [sic] and the "McCarran" Amendment extend to such rights, as they are rights under "federal law".

In the opinion of this Court, the same rationale applies to the rights of dedicated federal lands where the single or major source to supply water to meet that purpose or fulfill a P.I.A. requirement is groundwater. If that groundwater was available on the date of the establishment of the national forest, park, monument or reservation and it is now not reasonably available because others off the reservation have diminished the reservation's ground water resources by their pumping, there is no basis to apply any other rationale than that found in *Cappaert v. United States, supra.* Again, the court should structure any judgment or order to minimize damages and/or impact on innocent users.

Because each sub-watershed is to an extent different and the downstream location of federal and Indian reserved surface water rights is different as compared to where upstream ground water pumpers are located, it may be necessary to hold factual and evidentiary hearings to establish the parameters of what constitutes a significant diminishment of the water rights within such time frame as would affect the United States [sic] ability

to carry out the primary purpose of the reservation or federally reserved lands.

Conclusion

Based on all of the above the Court must conclude that the cities' motion to exclude all groundwater wells must be denied and it is so ordered. Dealing next with the specific issues of the 1/19/88 order the court answers them as follows.

1. Is groundwater included within the phrase "river system and source" as it is used in A.R.S. § [sic] 45-141 and 45-251(B) and if so. [sic] to what extent is it included?

Answer. Groundwater is included in the appropriable water only when it meets the criteria of "sub-surface flow" as defined above or when the water source is for a claim based on federal law.

2. Is groundwater included within the phrase "water subject to claims based upon federal law "as it is used in A.R.S. § 45-251?

Answer. Yes.

3. Assuming that percolating groundwater is not included in the definitions of A.R.S. §§ 45-141 and 45-251(B), does a McCarran Amendment Adjudication, require that percolating groundwater be included and if so, how can this be done under Arizona law?

Answer. No, the McCarran Amendment doesn't require it, but federal law requires its inclusion where the claim is based on federal reserved rights.

4. If the answer to Issue No. 3 is in the affirmative, does the adjudication have to include only claims under federal law or must state law claims as to percolating groundwater also have to be included?

Answer. No. However cataloging all such percolating groundwater claims will serve a significant purpose and should be done. It is not required.

5. If the answer to Issue No. 3 is in the affirmative, does the adjudicatory process extended to a determination of rights to percolating groundwater which is normally in this state subject to a "reasonable use" standard to the same extent as it does to surface water which normally is subject to "prior appropriation" standard?

Answer. No, where the use of groundwater affects only state rights. Yes, where the use of groundwater affects federal rights.

6. Does the "Winters" Doctrine of Federal Reserved Rights apply to percolating groundwater under and/or outside of a federal reservation, how does it apply and does it apply only to the reduction of surface water resources and/or groundwater resources beneath the federal reservation?

Answer. Yes. See above.

7. If percolating groundwater in the watershed of the Gila River System is subject to the jurisdiction of this adjudication, what is the affect of the Groundwater Management Act of 1980?

Answer. Technically there should be no effect as rights under the Groundwater Management Act are neither appropriative rights under A.R.S. § 45-141 or rights

claimed under federal law. Practically however, rights of groundwater users in A.M.A.s and I.N.A.S [sic] would have to be considered when and if a court decides how to satisfy federal reserved rights and how to apportion the same between surface water and groundwater.

8. Are there technical and/or procedural problems in determining, prioritizing and/or apportioning groundwater rights which present problems of such magnitude in the reliability of the data for such a determination that an attempt to prioritize ground water could violate due process requirements?

Answer. None sufficient to preclude the adjudication.

Having ruled on the legal issues before it from the motion and the eight questions before the court, the Court will now move to the area of its instruction to the Department of Water Resources for its Hydrographic Survey Reports.

First, these reports should include all claims of surface rights and claims where the water being used is subsurface flow under the criteria previously described. These rights are to be cataloged, prioritized and entitlements assigned thereto by indicating the nature, extent and relative priority thereto, all as required by A.R.S. § 45-256. All other groundwater sources, not involving federal claims, shall be cataloged and their data determined as previously indicated.

When dealing with a claim made under federal law, the same procedure should be followed for those claims where the federal claim is for a diversion and use which is in physical use at this time. Where the claim is for a

federal reserved right and there is no present physical use D.W.R. shall also:

a. determine all sources of water reasonably available to meet the claim presently [sic]

b. determine the limits and characteristics of availability on the date as to which priority is established [sic]

c. determine [sic] the entitlement on the basis of a reasonable assessment of the reservations [sic] P.I.A. or, if not an Indian reservation then the property's primary purpose.

d. In determining a prioritization of such claimed federal reserved right, it will be necessary to determine all stream users or diversions of either surface water or groundwater which significantly affect those sources reasonably available on, at or near the federal parcel which would be available to fulfill the determined entitlement.

e. To the extent possible, exclude each domestic and stock water well and irrigation well irrigating no more than 2 acres, where D.W.R. determines that such wells [sic] diversions have so little effect as to be significantly unmeasurable.

Previously, in the third section of this order, this court discussed the federal claim of what comprehensiveness a "McCarran" Act adjudication required and concluded that what the federal claimants argued for was beyond what the law required. However, all case law and legislative history on the "McCarran" amendment indicates a preference for adjudications in state court because they can be more "comprehensive". While federal courts

can and often handle such, most adjudications are in state court because of an ability to be more comprehensive. To that extent, a "McCarran" Act adjudication does require some degree of comprehensiveness. In the opinion of this court, this adjudication under the parameters above outlined will meet that test.

DATED this 9 day of Sept. 1988

/s/ Stanley Z. Goodfarb
Judge

SUPERIOR COURT OF ARIZONA
MARICOPA COUNTY

CC04 33390 — Code
9/9/88 — Date

HON. STANLEY Z. GOODFARB
Judge/Commissioner/Pro Tem

E. Schneider
Deputy

NO. W-1, W-2, W-3, W-4

In Re the General Adjudication
of All Rights to the Water in the
Gila River System and Source

This Court's order with reference to the relationship of surface and groundwater covering the issues argued on May 20, 1988 was approved, settled and signed this date with copies sent to all attorneys on the approved mailing list herein.

The Court has received Motions to Intervene and Orders with reference of Mark J. and Colette Westervelt, Bruno and Jollyn A. Salamone, and Peggy M. Hitchcock. All of these Motions will be taken up at the Court's next meeting on Friday, September 30, 1988 at 1:30 p.m.

Further, the Court advises counsel that a program by the American Water Resources Section has been scheduled for Friday, October 28, 1988 at the Sheraton Pueblo Inn, Tucson, Arizona. The court has been invited to be a speaker thereto. The Court notes from a preliminary program send [sic] to it that a number of attorneys in this case are also scheduled to be speakers at this meeting. Therefore, rather than have our October meeting on Friday, October 28, the Court will schedule a meeting for

1:30 p.m. on Thursday, October 27, 1988 so that any and all counsel who represent the claimants or DWR may attend the Tuscon meeting on the adjudication of water rights.

Pursuant to stipulation, and good cause appearing.

IT IS ORDERED that Jennele M. Morris be allowed to withdraw as counsel of record for the Cities of Mesa, Chandler, Tempe, Goodyear, Casa Grande, Avondale and Prescott, and that James P. Watts, of the law firm of Bill Stephens & Associates, P.C., be substituted as counsel of record for those Cities.

IT IS FURTHER ORDERED that James P. Watts is appointed to the Steering Committee previously established in this proceeding pursuant to Paragraph 10 of Pre-trial Order No. 1, all in accordance with the Order signed by the Court on August 31, 1988.

APPENDIX G

SUPERIOR COURT OF ARIZONA
MARICOPA COUNTY

RC11-33390 — Code
1-19-88 — Date

JUDGE STANLEY Z. GOODFARB
Judge/Commissioner/Pro Tem

E. Jackson
Deputy

NO. W-1, W-2, W-3, W-4

General Adjudication

As indicated at our December 17, 1987 hearing, John S. Schaper indicated an intention to offer his resignation as chairman of this Court's steering committee. This has been done and reluctantly accepted by this Court. A copy of this Court's letter of acceptance and statement of its appreciation for his work dated January 6, 1988 is attached and made a permanent part of the record of this case.

A formal order substituting Norman J. Davis for Alicia F. Tocco as attorney for the St. John's Irrigation District is filed this date.

This Court has had submitted to it a draft of a proposed pretrial discovery order and a proposed identification system which has been prepared by this Court's steering committee. Copies have been submitted to all counsel. The Court will take up the approval or modification of the order at the meeting on Friday, February 26, 1988 at 1:30 p.m. Any comments by counsel regarding the

orders shall be filed by 5:00 p.m. on Wednesday, February 17, 1988.

Pursuant to this Court's order at its November 20, 1987 hearing and the hearing on December 17, 1987, this Court has received the filed lists of issues which a number of parties submitted which they believe should be included in the question of the Ground Water and Surface Water relationship, all as raised by the Motion for Summary Judgment filed by a number of cities to exclude ground water from this adjudication. The Court has also considered the comments made by counsel at our hearing on December 17, 1987. As the Court said then, it has found in many of the lists submitted similar issues raised and in some there was submitted question [sic] of such complexity that a substantial factual hearing would be needed to provide a data base from which to start answering such questions. Such submitted issues have been discarded.

However, after attempting to distill all submissions to issues which can be decided as matters of law and after considering the evidence taken at our hearing on the issue from October 19 to the 23rd, 1987, the Court finds that in addition to the issues raised in the cities' motion, the Court will consider the following issues which it believes are related to the ground water relationship issues of this case.

1. Is ground water included within the phrase "river system and source" as it is used in A.R.S. § 45-141 and 45-251(B), and if so, to what extent is it included?

2. Is ground water included within the phrase "water subject to claims based on federal law" as it is used in A.R.S. § 45-251?

3. Assuming that percolating ground water is not included in the definitions of A.R.S. § [sic] 45-141 and 45-251(B), does a McCarran Amendment Adjudication, [sic] require that percolating ground water be included and if so, how can this be done under Arizona law?

4. If the answer to Issue No. 3 is in the affirmative, does the adjudication have to include only claims under federal law or must state law claims as to percolating ground water also have to be included?

5. If the answer to Issue No. 3 is in the affirmative, does the adjudicatory process extended to a determination of rights to percolating ground water which is normally in this state subject to a "reasonable use" standard to the same extent as it does to surface water which normally is subject to "prior appropriation" standard?

6. Does the "Winters" Doctrine of Federal Reserved Rights apply to percolating ground water under and/or outside of a federal reservation, how does it apply and does it apply only to the reduction of surface water resources and/or ground water resources beneath the federal reservation?

7. If percolating ground water in the watershed of the Gila River System is subject to the jurisdiction of this adjudication, what is the affect of the Ground Water Management Act of 1980?

8. Are there technical and/or procedural problems in determining, prioritizing and/or apportioning ground

water rights which present problems of such magnitude in the reliability of the data for such a determination that an attempt to prioritize ground water could violate due process requirements?

The Court will allow responses to the cities' Motion for Summary Judgment and a discussion of the above issues to be filed within 60 days of the date of this order and replies to these responses to be filed thereafter within 30 days. No parties [sic] response and reply shall exceed 30 pages for both documents but the allocation between the two shall be made by counsel. The Court will hear argument on the issue at its May hearing on May 20, 1988 at 1:30 p.m. While the 27th is the last Friday of the month, the 30th is Memorial Day and some counsel might have contrary plans for that period.

Copies of this order is [sic] mailed to all counsel on the Court's approved mailing list of December 14, 1987 which was attached to December 17, 1987 minutes.

DOCKETED

JAN 26 1988

1062

APPENDIX H

SUPERIOR COURT OF ARIZONA
MARICOPA COUNTY

RC11-33390 (Code) 11-20-87 (Date)

JUDGE STANLEY Z. GOODFARB
Judge or Commissioner

D. Glab
Deputy

NO. W-1, W-2, W-3, W-4

General Adjudication Continued

1:41 p.m. The November meeting begins with the following persons present: Duane Wyles, Riney Salmon, John Weldon, G.R. Carlock, Sheryl Sweaney, Jennele Morris, Joe Sparks, Margaret Vick, Patrick Barry, Joe Clifford, Doug C. Nelson, Alicia F. Tocco, W. Storey, Rory C. Hays, Bill Warskow, Jim Mitchell, John Schaper, Robert Hoffman, Tamara Huddleston, Tim Luke, Clay Dozer, Sandra Lee, Don W. Young, Mary Lu Moore, Dudley Welker, T.J. Harrision, Frederic Beeson, Robin Barnes, B.M. Apker, J.W. Johnson, Carlos Ronstadt, Marilyn Cage, Barbara Goldberg, Jim Callahan, Judith Dworkin, Sharen Meade, William Sullivan, Norman J. Davis, Jeff Tremly, George A. Schade, Jr, Flauviuer Carovetta, Karen Perry and Simpson Cox.

Court reporter, Terry Louis is present.

The Motion to Intervene of Tom and Evelyn Clark and Steven and Sandy Sutherland is discussed and is granted and signed by the Court.

The Motion to Intervene of SunCor Development partners is discussed and granted.

The Motion of B.C. Bass is discussed and granted and the order is signed by the Court.

After a discussion of the available dates, it is agreed that the December meeting will be held on Thursday, December 17, 1987 at 1:30 p.m., as this Court would not be available on Friday, December 18 and many counsel had other commitments on December 21st to the 24th.

The Court raises the issue of the volume of the file which relates to mailing lists. A discussion is held to reduce this volume and unnecessary work as to such lists. The Court agrees that the mailing list prepared by its clerk and attached to the minutes of each monthly meeting shall constitute the official list until changed. A certificate or statement attached to any document filed which states mailing was made to all on the official list shall be sufficient compliance for mailing. A list of all those mailed to will not be necessary. Pretrial Order #1 is amended and modified to allow such.

The Court raises the issue of the appointment of a Master by the Supreme Court and its hearing on the issue on January 7, 1988 at 9:30 a.m. D.W.R. is ordered to file with the Supreme Court its beliefs on the issues needed to be considered in the selection process. The Court also advises that it will make its own beliefs known in whatever manner the Supreme Court desires.

The Court notes it has received a report from the Steering Committee on the issue of "New Uses" of water subject to this jurisdiction, that is uses which became

effective after the closing of the date for Statements of Claim in a particular sub watershed. Any and all parties, including D.W.R., may comment on this report by 5:00 p.m. on December 8, 1987 and the Court will take up the matter at its December hearing.

A discussion is opened by the Court on the decision which the Court must make on the Ground Water and Surface Water "Interrelationship" which was the subject of the October 19th to 23rd, 1987 hearing. The Court then brought up the motion filed by numerous cities to exclude ground water from this adjudication. The Court advises it believes it appropriate to expand the citie's [sic] motion to the entire issue of the Ground Water and Surface Water Relationship, including whether or not the "Winters Doctrine" applies to ground water. It is agreed that all parties may submit a list of what issues should be included in the determination to be made, provided that no list shall exceed ten pages. The list shall also be submitted no later than 5:00 p.m. on December 8, 1987.

The Court will take up the scope of issues to be considered at its December 17, 1987 hearing. Upon its determination of the issues to be considered, all parties shall have 60 days to brief the same and 30 days thereafter to respond to the others briefs submitted. D.W.R. is specifically ordered to brief the issues ordered and respond, particularly with regards to the matters of what legal authority this Court has in this jurisdiction to act, in what ways different decisions would impact D.W.R.'s ability to provide accurate and correct information and affects upon administration of any decree arrived upon,

as well as what other issues D.W.R. as this Court's technical and administrative adviser D.W.R. [sic] believes must be considered for this adjudicative process to be meaningful.

The Court advises that after the above matters are decided, the Court in the future must begin looking at the shape, format and areas of decision which this Court's final decree should contain, so the process of this adjudication can be directed to proceed to achievement of that goal. The Court expresses the opinion that unless the process becomes goal oriented, the process will not expeditiously achieve what this adjudication needs to do.

Finally, the Court takes up the matter of the Third Set of Issues submitted by the Steering Committee and all the comments submitted thereto. All commenting parties are premitted [sic] oral statements. They are taken under advisement, but the Court requests an administrative response by D.W.R. to each comment where appropriate in twenty days and an additional ten days [sic] reply by the commentator thereafter if it desires. The Court will thereafter decide the same.

3:00 p.m. The meeting concludes.

Later: the Court having failed to take up the Motion to Intervene of Boral Concrete Products, it is ordered granting the same and order is signed.

William Sullivan of Martinez & Curtis, P.C. has been left off of the mailing list for a number of months through a clerical error. His name is now replaced on the mailing list.

IT IS ORDERED substituting the law firm of Larson, Soto & Arana as counsel for the City of Nogales in the above matter, all in accordance with the Order signed by the Court November 23, 1987.

APPENDIX I

SUPREME COURT OF ARIZONA

IN RE THE GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN THE GILA RIVER SYSTEM AND SOURCE	Supreme Court Nos. WC-90-0001-IR (Includes WC-90-0001-IR through WC-90-0007-IR (Consolidated) & WC-79-0001 through WC-79-0004) (Consolidated)
	Maricopa County Nos. W-1, W-2, W-3, W-4 (Consolidated)
	ORDER

(Filed Dec. 19, 2000)

The Court has received and considered "ASARCO Incorporated's Motion for Reconsideration of Decision on Issue 2 Following Remand" filed by ASARCO, Inc., and a "Motion for Reconsideration" filed by Arizona Public Service Company and Phelps Dodge Corporation, and the response to the motions for reconsideration requested by the Court to be filed by Salt River Project Agricultural Improvement and Power District and Salt River Valley Water Users' Association. Therefore,

IT IS ORDERED that "ASARCO Incorporated's Motion for Reconsideration of Decision on Issue 2 Following Remand" is DENIED.

IT IS FURTHER ORDERED that the "Motion for Reconsideration" filed by Arizona Public Service Company and Phelps Dodge Corporation is DENIED.

Dated this 19th day of December, 2000.

/s/ Thomas A. Zlaket
THOMAS A. ZLAKET, Chief Justice